The Chemical Age

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Safety First

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International Approach to Research

LESS spectacular than the creation of an international organisation for defence, but also of far-reaching importance to the future of Western Europe, are the steps which are being taken to lay the foundations for closer co-operation in research.

A notable example of the benefits which can be derived from international research is a new blast furnace under construction at Liège, which was cited by Dr. Alexander King in a paper presented at the International Symposium on the Organisation of Scientific and Industrial Research. This furnace incorporates a novel process in which oxygen is used in place of air and is capable of using relatively low-grade ores. An important advantage is that the coke used need not be of metallurgical quality, metallurgical coke being scarce on the Continent though adequate supplies are available in Britain. The project is being financed jointly by several countries, including Britain, the chief contributors being Belgium, France and Holland.

International co-operation on these lines has never previously been attempted in Western Europe, where research has hitherto been carried out independently in every country. The absence of a co-ordinated approach to applied research resulted in a tremendous duplication of effort and expenditure, much of which was avoidable. Another consequence was an excessive time-lag before knowledge independently acquired in various countries was finally pooled and given practical expression in processes and production lines. By shortening this period, closer co-operation in research can do much to improve production and so assist in restoring economic prosperity.

Through published papers, correspondence and personal visits, scientists have been able to keep touch with the work of their opposite numbers in other countries, but co-operation on these lines is not in itself sufficient to bring about that close co-ordination of research activities which would enable the maximum benefits to be obtained from the investigation of common problems.

This need is gradually being met. A number of international conferences have recently been held, at which scientists from Britain, the Dominions, Western Europe and the United States have had opportunities for personal contact. Through the Technical Information and Documents Unit, H.M. Government contributes reports to the OEEC Documents

Exchange Scheme and receives reports from other member countries.

It is possible that member countries may have much to learn from one another not only regarding the findings of research workers, but also in connection with the organisation of applied research, which has taken rather different forms in different countries. In this country a large scientific effort is maintained by the Government to promote the efficiency of the community services for which it is responsible. Three research bodies—the Agricultural Research Council, the Medical Research Council and the DSIR—undertake research in their separate fields, where necessary side by side with research in the industries concerned. Industrial research is carried out mainly by the larger firms, but a co-operative research system sponsored by the DSIR has grown up during the past thirty years. This machinery has proved very successful in Britain, but is not necessarily suited to the special requirements of other countries.

In the United States there are research institutes which undertake sponsored research on a confidential and, frequently, on a non-profit-making basis. In Canada, where there are relatively few large firms and industries separated by long distances, a very flexible system of Government research has emerged, mainly under the National Research Council. In Germany, France and Holland applied research has also been organised on distinctive lines.

An official of the DSIR was a member of Mission 81, which visited various European countries to study the organisation and use of applied research. This investigation culminated in the recent symposium, the purpose of which was to pave the way for international collaboration in research.

This movement involves no interference with national research programmes, but stems logically from the closer military and economic bonds which are being forged between the nations of Western Europe. As Sir Ben Lockspeiser observed at the first session of the symposium, we are justly proud of our European culture and we enjoy a high standard of living, but we see an anxious future ahead of us. Only by increased productivity can this high standard of living be maintained and improved, and to a large extent productivity is dependent on the wise direction and application of research. Co-operation in research is the corollary of co-operation in defence, and all European countries have much to gain by drawing on their common fund of experience, thus ensuring that the maximum economic and social benefits are derived from their aggregate expenditure on applied research.

Under the machinery set up through OEEC, an international approach is being made to certain urgent problems such as economy of sulphuric acid in the manufacture of phosphate fertilisers. This is a good illustration of the scope which exists for international co-operation in the field of research.

On Other Pages

The annual subscription to THE CHEMICAL AGE is 35s. Single copies, 9d.; post paid, 1s.: SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3954/5). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited.

Notes & Comments

Industry's Needs

IF everything that has been written since the war about the type of education industry's future leaders should be given was gathered together, it would at least make an excellent haul for the paper salvage dealer. Recently in one of the better-class Sunday newspapers a well-known academician suggested that industrial leaders would be better drawn from the students of arts and humanistic subjects than from the science. Others want to see the curricula for science widened by the inclusion of broader subjects, *e.g.*, some of the so-called arts. Only occasionally is it pointed out that education begins in schools and that the main preoccupation of headmasters and governing bodies today is to find any one who is prepared to teach scientific subjects for the low remuneration offered; it would be almost amusing if it were not so tragic to listen to so many voices extolling this or that recipe for the ideal university education and drowning the many fewer voices that point to this truly serious crack in the foundation —the dwindling reserves of science teachers in the schools and the inadequate flow of new recruits.

Standards Declining

THE academician who believes that arts students will cope better with industry's management problems will certainly see his theory put to the test; and those who want a much-broadened training for scientists can certainly expect a considerable leavening of pre-university education. These things will happen whether anybody plans them or not. Indeed, in a generation or so it may be possible for those who now distrust the more specialised scientific educations to pat themselves on the back by proving that industry is steadily increasing the proportion of arts scholars in its intake of recruits. Industry, however, will have no alternative. Less and less first-class material will survive the diminishing capacities of schools to teach science, especially chemistry, well; and what does survive will be avidly seized by the universities and groomed for lifetime service in specialised science. Year by year the standard of science-teaching in our schools drops back, simply because the payment for teaching science is much below the standard of payment for practising science. For every word that is said about this, a hundred are spoken about reconstructing university methods and introducing new curricula and objectives. Industry's future needs are primarily shaped in schools; universities complete and refine these processes but they cannot create the basic patterns.

Trouble on the Turf

NOT even the prolific Nat Gould would have dared to build up a racecourse fantasy as unbelievable —and, let it also be said, as evilly immoral—as the dope gang story that took some of the popular headlines last week. A master gang is believed to be using Cortisone, the scarce and very costly anti-arthritic drug which in this country is not yet available to relieve human illness. It is said that Cortisone, according to the dosage rate, can either slow down or stimulate a horse; furthermore, it is very difficult to detect subsequently whether the drug has been administered. The amount of Cortisone required to 'dope' a horse is reported to be some thirty times the dose required for treating the human being suffering from arthritis. At race-courses and training stables security measures are having to be tightened up for any odds-on favourite is liable to be given a slowing-down dose or any second favourite a pepping-up dose.

Deserve Punishment

COULD humanity sink much lower than this? A chemical that relieves pain and sickness but is still so scarce that only a minor percentage of patients can obtain its benefits—and smuggled-in black market supplies are being used to dope race-horses! It is to be hoped that the police will crack this conspiracy wide open. One inference must be drawn from the facts so far sug-

gested—no master gang could be operating without top-class scientific advice and help. The spiv, however skilled in his own manner, could not initiate this use of Cortisone nor is it likely that he could dispense the necessary doses. If there is eventually exposure, let it be made certain that the scientist or scientists concerned are professionally exiled whether or not the ordinary common law imposes its own sanctions.

New Uses for Vitamin P

ALTHOUGH vitamin P has been recognised for some years, it has attracted increased attention recently from the discovery that it can offset some of the harmful physiological effects of radiation. The original verdict on this vitamin's function was that it acted as an anti-haemorrhage factor. There is no doubt a close biochemical connection between these two effects, for internal bleeding is one of the most severe consequences of radiation sickness. Vitamin P would certainly have an important role to play in atomic warfare, but even in peacetime it must surely have specific and valuable functions. The development of atomic energy and its fission products will undoubtedly mean that more and more workers handle radiating material and supplementary intake of vitamin P could form a useful part of the necessary protective measures. Radiation therapy for cancer is all too frequently limited by its side-effects and here vitamin P should help to increase the toleration of patients.

Preparing for Demand

COMMERCIAL production of the vitamin recently commenced in the American citrus industry. In general vitamin P occurs with vitamin C—certainly in citrus fruits the two trace nutrients are to be found in parallel occurrence. British work during the last war is believed to have shown that vitamin P is usefully present in blackcurrants. The new U.S. process will extract the vitamin from molasses made from citrus hull juices; to begin with, some 50 pounds of the vitamin will be produced per day. The process appears to have been started as a by-product venture and it anticipates a demand for vitamin P not yet expressed.

Diamonds by the Dozen

HENRY EYRING, a leading American physical chemist, told the Southwide Chemical Conference in Alabama on 20 October last that recent work may make feasible the practical synthesis of diamonds in his lifetime. The nonchalance with which this startling prediction has been received by a world already grown blasé to such things is typical of this period of history. Charles II would have treated the matter very differently. Faced with a man who said he could make diamonds, he would have promised him a peerage (or more) if he succeeded, and the Tower if he failed. At any rate, he would have been acutely interested. Nowadays the atom and its associated particles have usurped the old position of gold and diamonds completely. Nobody now tries to make gold. Plenty of people are making plutonium. Nevertheless, the diamond does represent a peak of a certain magnitude in chemistry, even if it has been rather neglected, rather like a mountain that is not quite as high as its neighbour. Ever since Moissan in 1893 produced the first tiny, worthless diamond by crystallisation under pressure from molten iron, it has remained a source of challenge to chemists. It has lain inert, made exclusively in the laboratories of Nature, a miniature Everest, unconquerable. The phase diagram of carbon contains, and has contained for years, as much unexplored territory as the Brazilian Amazon. The largest synthetic diamond ever made was by Hershey in 1936, and even this measured only 1 mm. by 2 mm. Now all that is going to be changed, and some chemist with thousands of degrees of temperature and thousands of atmospheres of pressure at his disposal will be able to turn off the electric furnace one day, cool off its contents and come back and dig out the diamonds. Another natural citadel will have fallen.

Library Holidays

The Chemical Society Library will be closed for the Christmas holidays from 1 p.m. on Saturday, 22 December, to 10 a.m. on Friday, 28 December, it is announced.

Work of the Royal Society

Professor Adrian's Presidential Address

IMPORTANCE of the work of the Royal Society as an independent self-elected body which can act as an impartial adviser to the Government on matters of scientific policy was stressed by Professor E. D. Adrian in his presidential address at the anniversary meeting of the society held in London on 30 November.

At the opening of his speech Professor Adrian gave an appreciation of the work of the recipients of the society's medals for 1951.

The Copley Medal had been awarded to Professor D. Keilin, F.R.S., for his fundamental researches in the fields of protozoology, entomology and the biochemistry of enzymes.

Professor Keilin's early work was on parasitic insects, and it contained much that was of lasting value and some which was regarded as classic. It was his interest in parasitic insects which led him to study the peculiar haemoglobin in the larvae of the horse bot *Gastrophilus*, and from this had developed the brilliant series of biochemical investigations which, in the ensuing 25 years had resulted in his numerous important discoveries concerning haem compounds and a range of catalysts of biological oxidations.

Keilin had purified polyphenol oxidase and laccase, and showed that these enzymes were copper proteins. He had also discovered haemo-cuprein and hepato-cuprein, copper proteins from red blood cells and from liver respectively. The purification of carbonic anhydrase led to its characterisation as a zinc protein. His researches had thus illuminated the rôle of other trace elements in addition to iron.

Royal Medal Award

A Royal Medal had been awarded to Sir Ian Heilbron, D.S.O., F.R.S., for his distinguished contributions to organic chemistry notably in the field of vitamin A and polyene synthesis.

Sir Ian was distinguished for his many notable contributions to organic chemistry, particularly in the field of natural products and in the development and exploitation of synthetic methods applicable to them.

After some early researches on various dyestuffs, Heilbron had made his first really important contribution by his work on the triterpenoid hydrocarbon, squalene, which occurs in fish oils, and by his structural elucidation of batyl and selachyl alcohols from the same sources. This marked the start of a great research programme on naturally occurring unsaturated aliphatic compounds which had continued to the present time. His work on squalene was followed by research on the carotenoids and vitamin A and in this he made extensive use of physical methods of investigation.

Acetylene Chemistry Developed

His synthetic work in the carotenoid-vitamin A field led to the development by him of acetylene chemistry, and the numerous reactions of acetylenic compounds discovered by him had been applied in many fields. Of particular interest was the rearrangement of acetylenic carbinols derived from unsaturated carbonyl compounds which had permitted the synthesis of long conjugated polyene chains and made possible the total synthesis of β-carotene by other workers.

In the chemistry of steroids Heilbron had carried out pioneer work on ergosterol, on the irradiation products of ergosterol and on algal and fungal sterols. His extended researches on the triterpenoids included the discovery of the key alcohol, basseol, which had played a vital part in the systemisation of the group.

During the war period he made notable contributions to the chemistry of penicillin and it was typical of him that he had exploited to the full novel synthetic reactions discovered in the course of his work on this subject and showed that they had wide application in other fields. His novel and elegant methods for the synthesis of purines, amino-acids and peptides were based largely on thiazole intermediates and stemmed directly from his penicillin work.

From the earliest days of his career Heilbron had realised the importance of the relationship between a compound's physical properties and its molecular structure and he had been a pioneer in the application of absorption spectroscopy and chromatography to organic chemical investigations. British chemists were probably more in-

debted to him than to any other chemist for the introduction of these techniques, and his influence had spread far beyond the confines of his own laboratory.

For his distinguished contributions to pathology by his studies of the functions of mucin and by his work on penicillin and other antibiotics, Sir Howard Florey, F.R.S., had also been awarded a Royal Medal.

Quite apart, however, from this outstanding contribution to medicine Florey had established a reputation among scientists as one of the leading exponents of the experimental method applied to problems of physiology and pathology.

Davy Medal Award

The Davy Medal had been awarded to Sir Eric Rideal, M.B.E., F.R.S., for his distintinguished contributions to the subject of surface chemistry.

Sir Eric's work had covered a very wide field in physical chemistry but the major theme had been surface chemistry and chemistry of colloids. He might be said to be the leader of the science of surface chemistry in this country and had done much to transform what was once a rather vague and unsatisfactory subject into one with a modern scientific form.

One of the principal fields of his activity had been the study of what might be called the two-dimensional state of matter.

Another was that of catalytic reactions, for example, hydrogenation at metal catalysts in which the rôle played by hydrogen atoms and other reacting species had been examined by ortho-para-hydrogen conversion and other techniques.

The Hughes Medal had been awarded to Professor H. A. Kramers, professor of theoretical physics, University of Leiden, Holland, for his distinguished work on the quantum theory, particularly its application to the optical and magnetic properties of matter. His work covered a wide variety of fields, but his name was best known in connection with the early application of quantum mechanics to atomic structure and radiation.

Turning to the work of the Royal Society during his year of office, Professor Adrian said that the policy of inviting the directors of various research institutes to give an account of what they were doing had produced meetings of great interest and the Fellows had had the privilege of visiting some of the laboratories to become acquainted with their work at first hand.

Although science did not advance because some one had set up a new committee it was never a waste of time for scientists to leave their laboratories to see new work in progress and to meet the men who were engaged on it; it was so much the better if the work lay outside the narrow field which they cultivated themselves.

If the society was to fulfil its duty to the State as an unprejudiced adviser of scientific policy, it was important that it should be adequately informed on the whole scientific effort of the country. Much of that effort now lay in the application of science to industry or agriculture or to the health of the community, and the co-operation of the institutions which had enabled them to learn at first hand was much appreciated.

Increasing difficulties of scientific publication were a source of anxiety to all scientific bodies. On the secretaries fell the considerable burden of editing the *Society's Proceedings*: the *A Proceedings* were now published at the rate of 3,000 pages a year and the interval between the receipt of a paper and its publication had been reduced to an average of 30 weeks.

Rutherford Memorial Fund

In his anniversary address last year Sir Robert Robinson had announced an appeal to create a Rutherford Memorial Fund and an appeal was launched simultaneously in other parts of the Commonwealth. It was hoped that a sum of at least £100,000 would be raised and about £70,000 had already been given or promised in the United Kingdom. In Canada the fund had reached $40,000 and the National Research Council had offered one of their post-doctorate Fellowships as the Canadian Rutherford Research Fellowship. Australia, India, South Africa and New Zealand, the birthplace of Rutherford, were collecting funds. the U.K. lists were not yet closed, and it seemed likely that the £100,000 asked for would be exceeded.

Encouraged by the response to the appeal, the Rutherford Memorial Committee had taken steps to advertise the first of the Rutherford scholarships, and the first Rutherford Memorial Scholar would be appointed to take up his scientific work in some part of the Commonwealth on 1 October, 1952.

Dr. Marsden had collected together the correspondence of Rutherford and copies of this would be placed in those universities with which he was associated, namely, Canterbury College in New Zealand, McGill University in Canada, Manchester and Cambridge Universities in England.

Sir John Cockcroft had been appointed as the first Rutherford Memorial Lecturer and it was proposed that he should visit New Zealand in the autumn of next year. By a happy turn of events he would go as a Nobel Laureate for the work which he did in the Cavendish Laboratory under Rutherford. In fact this year's award of the prize for physics to Cockcroft and Walton could not have been better timed as a reminder of all the great discoveries which had the stamp of Rutherford's genius on them.

A five weeks' visits to Canadian scientific institutions and universities at the invitation of the National Research Council of Canada had recently been completed by the assistant secretary. There and in the U.S.A. he had been able to see something of the organisation of the academies and research councils whose members were well known, but whose collective responsibilities differed in some way from those in this country. The personal contacts which Dr. Martin had made would make it far easier to have a clear picture of the direction of scientific research on both sides of the Atlantic. Need for personal contacts with the Commonwealth could not be too strongly stressed.

Commonwealth Fellows

Fellows of the society, elected for their science alone, had always been drawn from the whole Commonwealth. At present there were 18 Fellows in Canada, 12 in Australia, seven in India, four in South Africa, three in New Zealand and two in East Africa. The number had risen in recent years, but it must increase still further if it was to keep pace with the greater volume of scientific effort overseas.

After a brief survey of scientific advances which he showed had been given additional impetus and directed into unusual channels during the war, Professor Adrian went on to show how the physiology of the nervous system still offered an enticing variety of problems which led beyond the specialised regions of pure neurology. This was so because a better understanding of the nervous system should lead to an improved knowledge of its most remarkable product, the behaviour of the human species.

In fact the nervous system would be guided by a picture of the largest possible size, each item of which had been actively focussed. The neuro-physiologist had still a great many problems concerning the individual receptor cells, but the interest was shifting to their collective effect. The problem for the future would be to decide how the nervous system could react as it did to such a picture, how it was recognised and what determined the next step that the organism should take.

India Makes Benzidine

INVESTIGATIONS have recently been carried out in India, under the auspices of the Council of Scientific and Industrial Research, to study the possibilities of manufacturing benzidine in the country. Benzidine is one of the important intermediates used in the manufacture of direct cotton colours. In the manufacture of Congo Red, the most extensively used direct cotton dye in India, benzidine is required to the extent of about 30 per cent by weight of the dye.

The process developed has distinct advantages over present known ones. The use of expensive metals and chemicals for reduction has been eliminated by the adoption of an electro-chemical process. Optimum operating conditions have been worked out to obtain high efficiencies and yields.

The basic raw material used in this process is nitrobenzene, which is now manufactured in India and is available in commercial quantities. This is reduced electrolytically in the presence of caustic soda and a suitable catalyst. The product obtained, hydrazobenzene, is extracted with a solvent and treated with concentrated H_2SO_4, when it undergoes an intramolecular rearrangement to give benzidine, which separates out as its very difficultly soluble sulphate. This is treated with soda ash solution, concentrated under vacuum and cooled, when benzidine separates out. *p*-Aminophenol and 2 : 4-diaminophenol are also manufactured from nitrobenzene with the same type of equipment used in the manufacture of benzidine. These are also important dye intermediates.

Understanding Science

Need for Adequate Communication

WIDER dissemination of scientific knowledge in order to bring the discoveries of science to the service of the people was urged by Sir Edward Appleton, principal and vice-chancellor of Edinburgh University, when he delivered the Dallas Lecture to the Glasgow Junior Chamber of Commerce in Glasgow recently. He also called for more technologists—'men who have the urge to express themselves in the construction of practical things'—to shorten the gap between scientific discovery and practical use.

Scientific Research a Triangle

Adequate communication between different research groups, research workers and potential users was essential, said Sir Edward, who pictured the large-scale pattern of scientific research in Britain as a triangle, with university science, industrial science, and Government science at its three corners, and each linked with the other two.

Following the direction of his own thoughts the scientist tended to lose touch with the practical requirements of the world. His mind was not, as in war-time, applied specifically to other men's problems, but only to his own, which resulted in a danger of breakdown of communications.

Sir Edward went on to deplore the trend in some parts of the scientific community to develop a kind of stratification which isolated one specialist from another. No one disputed the need for the mathematician, the genetist, the metallurgist, the design engineer, and the technologist. Yet it was sometimes assumed that these occupied, by right, different stations in the scientific order, and even that one was more of a scientist than the other. The time had come to abolish all such snobbery. The only true test of scientific ability was originality, and originality was as worthy in one field as in another.

Even if this question of false status was removed there still remained the question of the best method of making the fruits of one specialist's work available to another and the problem of translating fundamental research into new technology.

A serious difficulty in Britain to-day, declared Sir Edward, was how to attract enough men of the highest class to the applied field in science. Too often such men had been infected with the idea that there was something 'not quite respectable' about applied science; that pure and applied science had a kind of 'Gentlemen *v.* Players' relationship and they must, at all costs, retain their amateur status. False distinctions must be got rid of, not only because it was commercially useful and expedient to do so, but also because it was the first condition of future progress in humanity no less than in science.

Technical information services in this country formed a complex network. There were, however, two dangers. One, that in the bulk of material produced really valuable information may get hidden. The other was the difficulty in persuading scientists to write well for the layman.

Gelatine & Glue Research Association

Sir Roger Duncalfe Opens New Laboratory

THE new laboratories of the British Gelatin and Glue Research Association at Holloway, London, W.2, were officially opened on 29 November by Sir Roger Duncalfe. This opening marked a well-defined stage in the history of the gelatine and glue industry. Previous to 1930, only a few firms in the industry had their own laboratories, and methods of manufacture varied so much that it was very hard to compare results. To-day not only do most firms possess their own laboratories but recognised methods of testing have been introduced and laboratory control of manufacture increased. The first stimulus to the formation of a research association came in 1943, but it was decided to be too expensive, and it was not until 1945, when the bone glue makers joined the manufacturers of hide gelatine and glue that the project became possible. The Association came into being in June, 1948, and in two years was the owner of a functioning research laboratory with a highly trained staff.

At the luncheon before the official opening of the laboratory, Sir Roger Duncalfe, chairman of the General Council of the British Standards Institution, described the growth of the industry from a production of 5,000 tons in 1900 to 30,000 tons in 1950, to a position where all home needs could be met and some exported. The Research Association, he said, was the logical outcome of growing co-operation in the ndustry and would provide a source of fresh progress. Sir Ben Lockspeiser, who spoke afterwards, emphasised the need to relate the research being done to the real future needs of the industry. The benefits that science can bring to industry, he said, are not so obvious that they will occur automatically. The Research Association provided a link between science and industry.

On show at the laboratories after the opening were the various stages in the manufacture, preparation, protection, and testing of glues and gelatine. In the organic and biochemical laboratory was a display of the method used for separating and distinguishing the amino-acid constituents of gelatine by paper chromatography. A quick method for the estimation of phosphate in bone meal rather superior to general determinations for phosphate was on view, as well as colorimetric methods for copper and iron. The micro-determination of nitrogen and a variety of micro-apparatus was also shown. The laboratory is equipped with injection type fume extractors.

The bacteriological laboratory next door concerned itself with the action on gelatine of various micro-organisms. Cultures on show depicted vividly the breakdown caused by *Bacillus mycoides*, a common constituent of soil and other organic matter on various specimens of gelatine, and the effect on the

The organic and biochemical laboratory, where much work has been done on the organic constituents of bone

bacteria of heat treatment, variation in *p*H, etc., of the gelatine. Under a phase contrast microscope it was possible to see the live bacteria.

The clarity of gelatine solutions is measured by photo-electric means. A useful home-made instrument was on show in the Physics laboratory for dealing with various samples of gelatine solution. This differentiated between colour and clarity. The laboratory was also fitted with a Bellingham & Stanley polarimeter.

The Technical Laboratory showed detailed photographs and descriptions of how glue and gelatine are extracted and made. Beakers containing various raw materials, intermediates and end-products showed the processes in various stages, both in the treatment of bones and of hides. By-products of the glue and gelatine extraction include bone china and bone flour, meat and bone meal, hoof and horn meal, etc. The end-product glue can be produced either in finely ground form, or in cubes, or as 'pearl glue', the latter being made by spraying it into cooled white spirit. The laboratory is equipped with an Avery joint-testing machine for testing the strength of glued joints, and the use of this was demonstrated.

Other rooms in the building on view included an up-to-date balance room containing a Stanton aperiodic balance with fully automatic weight-loading, together with a micro-balance; a library; an autoclave room; the physical chemistry laboratory, containing a demonstration of the measurement of viscosity of dilute solutions of gelatine; a constant temperature workshop; and stores and other workshops.

IN THE EDITOR'S POST

Allethrin Manufacture

SIR,—You are referred to the reference made under your 'Notes and Comments' page of your edition dated 6 October, concerning the production of allethrin by Carbide & Carbon Chemical Corporation in the United States.

I feel I should refute the suggestion that large-scale production of allethrin is likely to embarrass pyrethrum producers in East Africa.

I have recently returned from a visit to the United States, when I discussed the pyrethrum situation with officials of the Bureau of Entomology and Plant Quarantine and also with all the largest buyers of pyrethrum and pyrethrum-like insecticide raw materials. It is apparent from the notes which appeared in your paper that you have yet to receive information as to the efficacy of allethrin as compared with pyrethrum. It has been determined in numerous research laboratories that, whereas natural pyrethrins are able to control a wide range of insects, the action of allethrin is peculiarly selective. Although comparative control between natural pyrethrins and allethrin is more or less identical with house-flies, and natural pyrethrins only lead allethrin by a short head for mosquito control, a far greater quantity of allethrin is required to kill 'hard cased' insects, such as cockroaches, weevils, etc.

The main disadvantage of allethrin, from the economic point of view, is that no synergist has yet been discovered which is comparable with the synergistic action of at least two known pyrethrum synergists. Whereas these may increase the efficiency of pyrethrins by as much as 400 per cent, no synergist is available which is able to increase the effectiveness of allethrin with any degree of significance. The present price of 1 lb. of natural pyrethrins in the United States works out at $55; 1 lb. of allethrin is now priced at $40. If one adds the cost of the synergist and divides by a figure which represents the increased efficiency caused by synergistic action, it is found that the cost of effective allethrin application is nearly 50 per cent more than the cost of effective pyrethrins application.

Undoubtedly, when large-scale production of allethrin has been achieved there is likely to be a significant reduction in cost; however, from the information I have available, it is believed that even if the cost per lb. of allethrin is halved, such a situation is unlikely to have a serious effect on the market for economically produced pyrethrum.

Unless a greatly improved allethrin can be developed, or more efficient synergists can be discovered, it is probable that insecticide manufacturers may find it difficult to sell allethrin-based insecticides which do not contain a certain amount of pyrethrins.
—Yours faithfully,

N. HARDY.

Executive Officer, The
Pyrethrum Board of Kenya.

Chemistry & Physics of Paintings

Scientific Aids to Restoration and Conservation

THE chemist's important rôle in aiding the restoration and preservation of paintings and in establishing the authenticity of works of art is not perhaps as fully appreciated as it deserves to be.

'Chemistry and Physics of Paintings' a paper delivered by Dr. A. E. Werner, of the National Gallery, to a joint meeting of the London and South Eastern Counties Section of the Royal Institute of Chemistry and the Cambridge University Chemical Society held at Cambridge recently, is therefore of particular interest.

Dr. Werner began his talk by explaining, that regarded purely as a physical object, a painting had a stratified structure in which there were four essential layers.

Starting from the back these layers were: (1) the support, usually of wood or canvas; (2) the ground (or gesso), consisting usually of an inert substance, such as chalk or gypsum in glue, although in later years white lead in oil was sometimes used; (3) the paint layer proper, consisting essentially of pigment particles embedded in a binding medium, usually either egg tempera or oil; and (4) the varnish which served as a protective surface coating and enhanced the brilliance of the picture.

Picture-mechanics dealt with the stresses and strains to which this system of closely associated layers was exposed, continued the doctor. The commonest source of trouble in picture conservation was paint cleavage: this occurred when the ground and paint layers were no longer able to follow the dimensional changes which the support—particularly if of wood—underwent in response to changes in the relative humidity of the environment. The bond of adhesion was overcome, and blisters developed, which might lead to subsequent paint flaking.

Prevention by Air-Conditioning

Strict control of relative humidity by air-conditioning was the only certain way to prevent this trouble, but the development of paint-cleavage could be greatly diminished by applying to the back of the panel a moisture vapour barrier, that is a material which reduced the transfer of moisture vapour either to or from the surroundings. Experiments had shown that polythene sheeting was an ideal material for this purpose; it was stable and inert, had a very low moisture vapour permeability and was easy to apply.

To assist the restorer in his work of picture conservation systematic use was made of physical and chemical techniques, including X-ray, ultra-violet and infra-red radiations, microchemical analysis, microscopy, and so on. The most important of these scientific tools was X-ray photography. The degree of absorption of X-rays as they passed through the picture depended upon the specific absorption power of the pigments present and upon the relative thicknesses of the paint layers.

Use of Lead White

It was particularly fortunate that lead white had been so extensively used as an artist's pigment. Owing to its high absorption power, the X-ray photograph frequently bore a striking resemblance to the superficial pictorial image. In order to obtain an X-ray photograph which would exhibit the necessary delicate gradations in photographic intensity and so yield the maximum of information about the painting, low voltages of 10-15 kV were used with currents of about 15 milliamps and an exposure of 60 to 90 secs., depending upon the thickness of the support. Exact recording of physical data was necessary; otherwise the interpretation of the X-ray photograph might be misleading.

Examination of paintings under ultra-violet light (down to about 3,000Å) was used to detect retouchings and traces of old varnish in shadows; the old varnish exhibited a strong lemon-yellow fluorescence, whereas retouchings fluoresced less than the original paint. Infra-red photography was also of considerable value because the infra-red rays penetrated through surface varnish and the uppermost paint layers, with the result that much could be revealed which was not apparent to the naked eye.

Scientific methods might under favourable circumstances be used to produce compelling objective evidence about the authenticity of a disputed painting. The pigments present in a painting could be identified by microchemical tests (using in particular

some of the newer organic reagents for metals), comparison of the pigment particles under the microscope with authentic specimens and determination of their optical characteristics. Identification of media was more difficult, but preliminary experiments indicated that chromatography might be a powerful tool in this field.

The lecturer concluded with a brief reference to the use of scientific aids in the detection of fakes. Fake van Gogh paintings had been detected because X-ray photography revealed a great difference in the technique of van Gogh and his imitator. In the recent van Meegeren forgery case X-ray photography had revealed underneath the pictorial image recognisable areas of another painting. In the case of one of the pseudo-Vermeers, 'The Last Supper', the scientific evidence was strikingly confirmed, because it was possible to identify these underlying recognisable areas in the X-ray photograph with those in a photograph of a painting by A. Hondius known to have been purchased by van Meegeren.

New Catalyst Plant Open

Will Save Dollars

THE new £1,000,000 plant for the manufacture of the catalyst required in fluid hydroforming was opened at Warrington on 4 December by Sir Geoffrey Heyworth, chairman of Lever Brothers & Unilevers, Ltd.

This plant will supply oil-cracking catalyst required by five oil companies in connection with their sterling area refinery expansion programme. It is the result of agreements reached recently between Joseph Crosfield & Sons (an associated company of Lever Bros. & Unilever), and the Davison Chemical Corporation of Baltimore, U.S.A., and between Crosfields and Esso, Anglo-Iranian, Shell Marketing and Trading, Trinidad Leaseholds and Bahrein Petroleum. Technical advice and guidance in the design and operation has been provided by The Davison Chemical Corporation, whose process will be worked and who are the leading catalyst manufacturers in the U.S.A.

The main raw material in the manufacture of catalysts is sodium silicate, of which Joseph Crosfield & Sons are the major producers in the United Kingdom. From the foundation of Crosfields in the year of Waterloo, the company have concentrated on research work and scientific development, and in addition to becoming world-famed soapmakers, have specialised in chemicals production.

The plant equipment includes two Swenson Evaporator Company stainless steel dryers which have been fabricated under licence in this country. These are the largest dryers of this type which have ever been made. Because of the strict chemical and physical conditions which must be observed at all stages in manufacture the plant embodies some of the most modern methods of chemical production control in the form of automatic temperature, pressure and flow controllers.

The war-time demand for ever-increasing quantities of high-octane aviation fuels resulted in the development by the oil industry of more efficient production methods, the most outstanding of which was the fluid catalytic cracking or fluid hydroforming process, and by the end of the war an enormous refining capacity operating this process had been installed in the U.S.A.

The demand for high-octane aviation and motor spirits continues to increase and the Oil Companies' plans for refinery expansion in the sterling area include the installation of fluid catalytic crackers. These crackers are either in operation or about to go into operation.

Design work for the plant at Warrington was begun in March, 1950, and clearance of the site in June, 1950. Under the direction of Messrs. E. B. Badger & Sons (Great Britain), Ltd., construction work was started by the main contractors (Taylor Woodrow Construction, Ltd.) in October, 1950. With a few exceptions the plant has been constructed and equipped with materials of British manufacture. In the exceptional cases, the equipment was obtained from the U.S.A.

Will Save Dollars

The operation of the plant at Warrington will represent an immediate saving of several million dollars annually.

The new plant is designed to operate continuously, but only about twenty men will be needed on each eight-hour shift because of the number of automatic controls. The total labour force, including maintenance men, will be about 120. All these have been recruited from other sections of the Crosfield organisation in Warrington.

Chemical Fertiliser Production

Effects of Sulphur Shortage and Subsidy Removal

DESPITE the cuts in sulphur supplies and the increase in prices due to the removal of the fertiliser subsidy, increased trading profits were revealed in the statement by the chairman, Mr. F. G. C. Fison, at the 58th annual general meeting of Fisons, Ltd., held at Ipswich on 3 December.

Consolidated trading profits of the group after providing for ordinary expenses of the business rose from £1,233,724 to £1,901,631 These figures included the trading profits of the British Chemicals & Biologicals group which amounted to £221,071 compared with £93,858 in the previous 12 months.

The chairman opened his survey of the year with a reference to the new plant at Immingham where the first triple superphosphate was produced in the spring of 1951. Unfortunately, before the plant could be brought into full operation the sulphur crisis came to a head. Drastic cuts in supplies had resulted in the Immingham plant only being able to operate at two-thirds of its full capacity.

Cuts in acid supplies had also affected production at Avonmouth, with the result that considerable quantities of fertilisers which the company could have manufactured, had had to be imported from the continent.

Production of a higher percentage of compound fertilisers in granular form had been made possible by the granulation plant at Barking which came into operation during the year.

Subsidy Removed

The second half of the fertiliser subsidy was removed on 1 July, 1951, which no doubt led to some purchasing for stocks in anticipation of higher prices. The actual increase in prices due to the final removal of the subsidy had been larger than expected, owing to the rise in the cost of raw materials and freights.

It was difficult to assess at present how these high prices would effect demand in the spring of 1952.

Fisons had taken a leading part in the formation of the United Sulphuric Acid Corporation which would produce sulphuric acid at Widnes on a large scale from anhydrite, with cement as an important by-product. The process would be the same as that which had already been operated at Billingham for many years by Imperial Chemical Industries, Ltd., which was to provide the necessary technical services.

This project was a good example of a co-operative scheme sponsored, as it had been, by 11 companies, to meet the shortage of sulphuric acid. From the strategic point of view it was also of value, as anhydrite was indigenous. Fison's participation would secure it 35,000 tons of sulphuric acid a year. It was hoped the plant would come into operation in 1954.

Sulphur Position

Mr. Fison went on to give a brief summing up of the sulphur position. He pointed out that in considering the installation of the acid plant at Immingham it had been based on sulphur rather than pyrites because of the lower capital and operating costs and also because it produced heat required in other processes. There was at that time no indication, official or otherwise, that the supply of sulphur from America would become difficult. The first signs in fact appeared rather less than two years ago.

Although having confidence in the possibilities of anhydrite it was realised that this could not prove a general solution to the scarcity problem.

In view of this and as one of the largest individual consumers of sulphur the company had explored sources of sulphur outside the U.S.A., but in most cases owing to their geological nature, formations were not as cheaply exploitable as the deposits in America. Fisons had taken a leading part in the formation of a sulphur exploration syndicate and an extensive programme of exploration had been begun.

Raw materials supply, apart from acid, had in general been satisfactory on the fertiliser side. There had been some slight stringency in sulphate of ammonia supplies, but deliveries of phosphate rock and potash had been adequate. As part of the arrangements for the removal of the second stage of the fertiliser subsidy, certain changes were made in the methods of purchasing phosphate rock and potash.

It was the general wish of the industry that the purchase of phosphate rock in

particular should revert to private enterprise and the industry had put forward a detailed scheme for setting up a collaborative buying organisation to deal with the French North African Phosphate Trust. Influenced no doubt to some extent by the developments in Korea, the Government had decided that it could not release the purchase of this important raw material.

Fisons was well equipped to carry out its own chartering operations, and it would be appreciated that the freight element on so bulky a material was an important factor in its cost and the scale of operations was such that it would be economic to purchase phosphate rock at the North African port.

Arrangements finally made, however, gave the company some benefit from its facilities as it was now able to buy phosphate rock at ship's rail instead of a flat delivered rate operating for all consumers.

Yorkshire Potash

Exploratory drilling for potash in N.E. Yorkshire had continued with satisfactory results and a comprehensive report was being prepared for the Government, with which a policy for winning the potash would shortly be discussed.

Associated companies in South Africa, Rhodesia and Canada had all done well. A new factory at Salisbury, Southern Rhodesia, had been officially opened by the Prime Minister on 11 April, 1951.

Reorganisation of the British Chemicals & Biologicals Group was nearly completed and was yielding improved results.

Good progress had been made with the new ethical medicinal specialities. A good deal of research had been devoted to Dextran-Benger for the replacement of blood plasma and important results were already emerging from this work. The fine chemicals section had also expanded and export sales had been exceptional.

Fisons had maintained its position in the forefront of technical development in the fertiliser field, and its research workers had contributed important papers to the transactions of the Fertiliser Society. Research was being carried out with the object of substituting nitric acid for sulphuric acid in the solubilisation of phosphate rock.

To maintain its position as one of the leaders in the technical field the company had decided to extend its research activities. Mr. C. E. Horton, C.B.E., formerly director of research to the Admiralty, had accordingly been appointed as director of research. In addition to extending the scope of work on the fertiliser side, Mr. Horton would be responsible for the whole of the research work of the group.

Combating Oil Fires

Mobile Foam Production Units

EFFICIENCY of large capacity modern foam fighting equipment in dealing with oil fires was demonstrated recently at Avonmouth when a 4-in. jet of foam was delivered at the rate of 2,400 gallons a minute on to the top of a 40 ft. high oil tank.

The demonstration successfully dispelled doubts alleged to have been expressed, following the disastrous fire at Avonmouth in September, that manufacturers had not given sufficient attention to the need for production of large quantities of foam, and that there was a tendency for fire brigades to continue to rely on small capacity foam equipment although more modern types were available.

To make the best use of foam equipment or foam compound on a fire it is essential that ample supplies of water are available immediately operations begin. Delivery of foam to any fire at a rate below the recognised minimum is waste of valuable material.

One certain method of getting foam into an oil storage tank when it is burning is the provision of a mobile form of foam production operating in conjunction with fixed pipe lines extending through the fire wall to inlets fitted to the top of the tank walls, or alternatively by base injection. This system has revolutionised fire fighting in large oil refineries and tank installations by eliminating the vast quantities of piping hitherto required.

Foam tenders designed for this purpose by the Pyrene Company, Ltd. (which gave the demonstration), carry 600 gallons or more of foam compound, mechanical foam generators, and a pump or pumps to deliver water at the required pressure from static or low pressure hydrant supplies.

Output of foam from one of these tenders can be as high as 6,400 gallons a minute, while at the same time it provides the rapid transit necessary for the effective protection of extensive oil installations.

Stability of Vitamins A & D in Animal Feeding Stuffs

by H. PRITCHARD, M.Sc., F.R.I.C.

DURING recent years marked changes have taken place in the animal feeding-stuffs industry. Whereas, formerly, the farmer was content to purchase oil cakes and such concentrates as were available and balance them with whatever grain, hay or roots he had grown on his farm, the tendency now is to rely on ready-mixed compounds. This trend, aided no doubt by the convenience of prepared feeds, is probably due to the expanding knowledge of the nutritional requirements of farm stock and the added difficulties of comprehending what is, to all but the expert, the complex field of the biochemistry of nutrition. There is little wonder, therefore, that the stock-feeder tends to shy away from his own compounding and rely more and more on ready-prepared feeding stuffs.

There is no doubt that the preparation of rations for livestock is becoming a specialised branch of industry and this has been borne out by the very rapid expansion of trade in these commodities. Whereas, at one time, the compounding business may have been started by either members of the flour milling industry as a channel for disposal of millers' offals or by the seed crushing industry for disposal of press residues, this branch of the business has now become so important as to justify considerable capital investment to enable it to operate independently as a service to the farming community. With increasing resources, the provender milling industry has been enabled to expand its research facilities and there are a number of the most up-to-date firms which have their own experimental farms and research laboratories.

Varied Storage Conditions

There is no doubt that ready blended mixtures when they leave the mill possess all the qualities claimed for them by the vendor (his laboratory has seen to that) but after leaving their source of manufacture to be subjected to a wide variety of storage conditions there is a distinct possibility that changes may take place in which quality may be lost. Naturally it is among the vitamins that the least stability is found and the losses tend to be highest in those of the fat soluble class, namely, vitamins A and D.

It is generally recognised that adequate amounts of vitamin A and D must be available to livestock on the farm and this was generally distributed in the past by the addition of cod liver oil directly to the feed just before consumption. More generally, nowadays, the feed compounder, in order to give his product its maximum efficiency, adds the vitamins A and D in the form of concentrate to the mixture in the factory. This procedure would be perfectly safe if the stability of the vitamins was certain but, as both these vitamins tend to lose their activity when exposed to air over a period, especially when spread in a thin film over the surface of a meal, it is certain that some loss of potency takes place, the degree depending on the time elapsing between compounding and feeding and other factors such as the composition of the ration.

Several Contributing Factors

Many observations have been made on the rate of disappearance of vitamin A and D after admixture in feedstuffs. The results obtained have varied widely from one another, and it has now been established that several circumstances such as the type of vitamin concentrate used, type of ingredients employed in the compound, method of mixing and temperature of storage, effect the result.

In general, I have found that there is a loss of about 40 per cent of the vitamin A potency as soon as the admixture is carried out, and a steady decrease in potency during storage under a wide variety of conditions; workers have even carried out storage tests in the absence of air without affecting the steady loss of potency on storage. Similar results were recently published by Motzok and his co-workers (*Poultry Science*, 1947, **26**, 86) in which he found that when cod liver oil was mixed with a normal poultry ration there was an initial drop in potency during mixing and in the first 15 weeks' storage amounting to 40 per cent of the vitamins. When an additional quantity of vitamin D_2 was used, 50 per cent of this too was

destroyed in the first 30 weeks' storage.

Moreover, it is abundantly evident that the mineral addition to the ration has a heavily destructive action on the vitamins A and D added. The mineral constituents consist for the most part of calcium carbonate and salt; a typical mineral mix might be as follows:—

	%
Lime	45
Bone flour	22
Salt	25
Iron, copper and manganese salts	8

Milby and Thompson (*Poultry Science*, 1943, **22**, 357) found that vitamin D activity was well retained, if the mixing was carried out on the whole feed. If, however, the vitamin was premixed with salt and calcium carbonate, before mixing with the other ingredients, a large portion of the potency disappeared. Various attempts have been made to counteract the destructive effect of mineral mixtures. Halverson and Hart (*J. Nutrition*, 1950, **40**, 415) for example, suggested putting the minerals in a dried gelatin mixture to avoid their extremely rapid destructive effect on vitamin A. Brack (U.S. Pat. 1949, 2,479,583) claimed that losses of vitamins can be avoided by adding 0.2 per cent sodium thiosulphate with a small quantity of caustic soda to the mineral mixture.

Other attempts have been made to stabilise the vitamin A and D mixture before adding it to animal feeding stuff. U.S. Pat. 2,321,400 (1943) claims that if the vitamin A- and D-bearing oils are emulsified with blackstrap molasses, the degree of destruction is reduced. Other workers have suggested adding the vitamin A- and D-bearing fish liver oil as an emulsion in water.

Apart from the destructive influence of mineral mixtures and the various attempts made to stabilise the vitamins by emulsion, the common ingredients of the normal feeding meal have a marked influence on vitamin stability. It has been established that oil cakes differ in their influence. Kehren (*Oléagineux* 1948, **3**, 387) placed four of the common oil-cakes in the following categories.

Linseed cake—Little destruction of vitamin A.

Cotton cake—Moderate destruction of vitamin A.

Sesame cake.—Moderate destruction of vitamin A.

Coconut cake.—Total destruction.

On the other hand claims have been made (U.S. pat. (1946) 2,401,293) that the fat-soluble vitamins can be stabilised by mixing the oil with finely divided wheat germ, pressed cake flour, corn oil meal, or dried distillers' grain solubles.

In general it can be said that unless special precautions, established experimentally, be taken by the provender miller, there is considerable risk that the vitamin A and D potency of the rations will have been reduced a good deal by the time they are fed to the animal. Furthermore, no real evidence has been put forward to support the contention that a means has been found of ensuring that all the vitamin A and D originally added to the mixture finds its way to the animal. Under these conditions it would be most advisable to refrain from adding the vitamin A and D until the last moment before feeding.

An arrangement such as this would have several advantages besides relieving both the miller and the farmer of anxiety concerning possible losses of potency. The various feeding stuffs could be compounded when most convenient from the point of view of supplies of raw materials, labour and available plant, and stored until required either in the mill or on the farm. The vitamin A and D supplement can be stored in the form of a good cod liver oil without change for long periods. Its long recognised value as an adequate source of vitamins A and D for calves, chicks, and pigs, especially in the winter, is stressed in Bulletin No. 48, 'Rations for Livestock' which also mentions the value of its high degree of digestibility and trace of iodine. An arrangement such as this would be quite convenient, as the provender miller could supply a good brand of cod liver oil in sealed pails in quantity equivalent to that which he would have added to the batch of feeding stuff in the normal way. The stock-feeder could then cover the mixture after emptying from the sack with the appropriate quantity of oil and roughly mix it in. In some cases, no doubt, there would be some degree of unevenness in the mixture, and some animals would get more than their share and others less, but it would have to be an exceedingly unfortunate animal which did not show an evening up of dosage during a few weeks. Small inconveniences in the way of handling it are far outweighed by the beneficial results.

Industrial Vinyl Chloride

Royal Shell Process in Holland

IN a paper read at the 6th National Chemical Congress in Milan last year and just published in *La Chimica e l'Ind.*, 1951, **33** (10), 613-619, J. C. Vlugter and co-workers, of the Royal Shell Laboratory in Amsterdam, review recent progress in the manufacture of vinyl chloride and the various methods used, and describe in some detail the process developed by Royal Shell in Holland, starting with ethylene. In this process the ethylene is chlorinated with $FeCl_3$ as catalyst, in a medium of liquid dichloroethane, at about 45°C. and under a pressure of 5 kg./cm². The plant used at Ijmuden is shown in Fig. 1, in three principal sections: (a) purification of the ethylene, (b) main reaction, (c) recovery and partial purification of the crude dichloroethane.

(a) As the refinery does not supply sufficient ethylene it has to be supplemented from other sources, *e.g.*, cokeries, from which a fraction is obtained rich in ethylene (about 40 per cent), ethane, methane, etc. The gas (C_2 fraction) has to be purified in a column still 6 m. high, under a pressure of 20 kg./cm.² with an upper zone temperature of −30°C., and lower zone temperature 30°C. The purified fraction still contains all the methane, about 40 per cent ethylene, and some ethane and acetylene. The gas is then passed into an intermediate container, under 12 kg./cm.² pressure, and thence into the chlorination unit.

(b) The main reaction takes place in a spiral reaction tube or coil and is strongly exothermic (39 k.cals/mol. of dichloroethane). To maintain the required temperature, therefore, the dichloroethane is preheated and passed rapidly through the coil so that there is intimate mixing of ethylene and chlorine, and no local overheating. Reaction takes place under a pressure of about 5 kg./cm.², so that not only is the rate of solution of the ethylene and chlorine in the reaction liquid and their conversion accelerated, but a much higher temperature

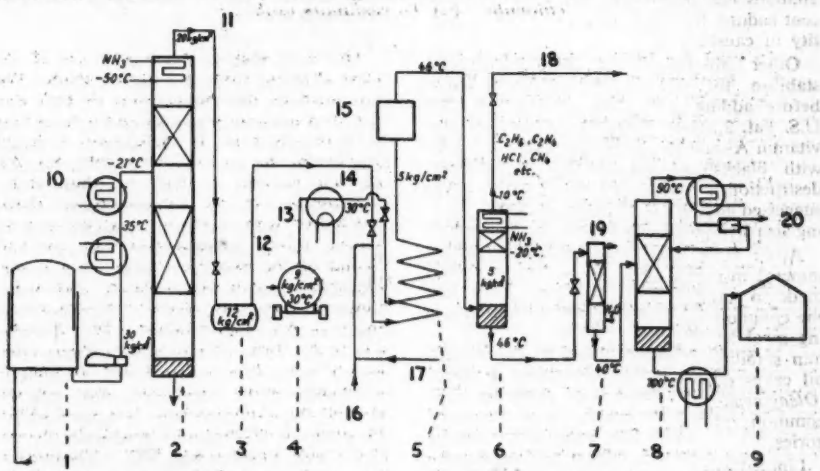

Fig. 1. 1. C_2 fraction from cokeries. 2. Purification column for C_2. 3. Container for purified C_2 fraction. 4. Chlorine tank. 5. Reactor. 6. Low b.p. gas removing unit. 7. Crude chlorine washer. 8. Azeotropic dryer for crude dichlorethane. 9. Tank for dried crude dichlorethane. 10. Fraction C_2 boiling. 11. Fraction C_2 purified. 12. Hot air. 13. Liquid Cl_2. 14. Gaseous Cl_2. 15. Intermediate tank. 16. Cooled dichlorethane. 17. Solution of $FeCl_3$ in dichlorethane. 18. To HCl and residue washing unit. 19. Wash liquor (water). 20. Wash liquor

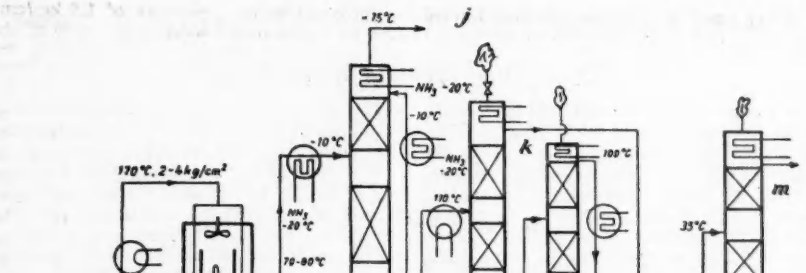

Fig. 2. ***(a) Pure dichlorethane tank. (b) Furnace for separation of dichlorethane. (c) HCl separation column. (d) Vinyl chloride separation column. (e) Purification of re-cycled dichlorethane. (f) Crude vinyl chloride tank. (g) Vinyl chloride purifier. (h) Collecting tank for tarry matters, etc. (Catrame). (i) Dichlorethane for cooling mixture. (j) Gas rich in HCl for reparation of 30-32 per cent HCl. (k) Crude vinyl chloride. (l) To residue collecting tank. (m) To tank for pure vinyl chloride. (n) To residuals tank***

can be used for heating the residual inert gases. Recovery of dichloroethane therefore reaches 99.5 per cent. In this way some 98 per cent of the ethylene is converted, and the product contains 96 per cent of 1,2-dichloroethane. Slight changes in optimum conditions, however, can easily cause lower yields. Electrolytic chlorine is used.

(c) Subsequent treatment of the crude reaction product consists of separating, under 5 kg./cm.², inert gas, HCl, and a small amount of unreacted chlorine, in a low column with Raschig rings and a temperature of the upper zone of −20°C.

The product thus obtained at the bottom of the column, removable under reduced pressure without the aid of pumping, then only contains some catalyst and traces of HCl and Cl_2. The first, especially, must be completely removed, otherwise troublesome decompositions may occur. This is achieved simply by washing with water. HCl may be similarly eliminated. Any water left in the product would create very corrosive conditions and may be removed by further (azeotropic or pseudo-azeotropic) distillation.

The next step is the production of the vinyl chloride from the dichloroethane. The two methods for the removal of HCl described in numerous articles and patents may be summarised as: (1) Separation in liquid medium in the presence of NaOH, Na, Zn, etc., and possibly alcohol. (2) Thermal decomposition of the dichloroethane above 300-400°C, with, perhaps, catalysts such as pumice, kaolin, active carbon, TiO_2, etc. The second of the two (pyrolysis), after a considerable amount of research and semi-industrial scale tests, was initially selected by Shell, as this yielded valuable HCl directly, not in the form of a relatively cheap commercial salt. It was also found, working in completely stable conditions, that conversion of the dichloroethane into vinyl chloride could be effected with practically theoretical yields, together with HCl. The process was continuous and there was no risk of decomposing the vinyl chloride or of the formation of carbonaceous or high molecular weight substances.

Some results, first in a pilot plant and then on a full industrial scale were as follows: Temperature 480-500°C., pressure

1.5-2 kg./cm.², in a reaction chamber formed of tubing of 7 and 10 cm. diameter; conversion on passage of dichloroethane 70 mol. per cent, useful yield of vinyl chloride 97.98 mol. per cent. The following considerations governed working under stable conditions: (1) The dichloroethane had to be pure (99.9 per cent) with complete absence of ferrous salts or chlorides of high Cl content, leading to formation or splitting off of unwanted substances; (2) In order to avoid secondary reactions it was necessary that conversion of dichloroethane should not exceed 70 per cent per pass: the unconverted residue was re-cycled; (3) The reaction was endothermic and heat had to be supplied, for instance, through the walls of the reaction chamber, and if working *in vacuo* a contact substance could be used to ensure better transfer of heat, so that pyrolysis could be effected at a little lower temperature; (4) The presence of water had to be very carefully avoided, otherwise there could be serious corrosion (condensation with HCl), and the formation of an ice coating on the condensers cooled to a low temperature.

These factors have all been taken into account in designing a plant at Rotterdam for the manufacture of vinyl chloride, comprising a preliminary purification column, reaction chamber, column for separation of low boiling compounds (HCl and traces of C_2H_2), separation column for the vinyl chloride and any residual products of fairly high b.p., final purification column, and another for recovery and purification of HCl. Fig. 2 shows the general layout and flow-sheet. As already noted extra heat is usually required, but in order to avoid excessive heating of the tube walls a special gas burner has been designed and placed near the bottom of the tube so that this is heated uniformly by means of a fan, the side walls being protected from the naked flame. This forms an effective and economical method.

The reaction gas leaving the chamber is rapidly cooled in order to speed up the reaction and avoid secondary reactions; also to condense compounds of high b.p. The products then pass through a tank in which settle out tarry substances that might otherwise clog up or contaminate the apparatus. Gaseous HCl is among the most important of the reaction mixture constituents, with a very low b.p. It is removed by absorption (rectifying) using dichloroethane as liquid absorbent under a pressure of 1.5 kg./cm.² with temperature in the upper part of the column of −10° to −20°C., and in the lower part of 40-50°C. The resulting HCl carries only traces of vinyl chloride and dichloroethane. In the lower part of the column are vinyl chloride, dichloroethane and traces of substances of high b.p. These are conveyed to the following column working under a pressure of 5 kg./cm.² where the vinyl chloride is condensed in the upper part with water, at a temperature of about 40°C. The crude vinyl chloride passes to an intermediate tank and thence to the final purification column. The fraction remaining in the lower part containing some dichloroethane and material of higher b.p. serves in part as a cooling agent and in part as an absorbent for the HCl absorption column; the other is circulated and passes to the pyrolysis unit after removal (by distillation under 1.5 kg./cm.²) of all high b.p. material that would contaminate the unit.

Final purification takes place under 5 kg./cm.² with the upper part temperature of 40°C. To avoid ferrous contamination the column is made of stainless steel. The still residue consists of a little dichloroethylene of b.p. between that of dichloroethane and vinyl chloride. With the HCl recovered in the separation column, a 30-32 per cent aqueous solution is prepared and may be sold, but traces of dichloroethane and vinyl chloride must of course first be removed by washing countercurrently with water in a column fitted with Raschig rings and suitably cooled, for instance, with dilute HCl; then further treated with inert gas to remove remaining vinyl chloride and dichloroethane. Other organic matter left is removed by filtering over active carbon.

Key Industry Duty

The Treasury have made an Order under Section 10(5) of the Finance Act, 1926, exempting dimethoxyethyl phthalate, methyl cyanoacetate and sodium 2: 5-dihydroxybenzoate from Key Industry Duty for the period beginning 11 December, 1951, to 19 February, 1952.

The Order is the Safeguarding of Industries (Exemption) (No. 12) Order, 1951, and is published as Statutory Instrument 1951 No. 2106. Copies may be obtained (price 2d. net, by post 3½d.) from H.M. Stationery Office, Kingsway, London, W.C.2, and branches, or through any bookseller.

Scarce Metals Easier

Supplies Better by 1954

ALTHOUGH shortages of basic metals now hampering defence production will probably be at their worst during the next four to six months, the United States Information Service reports that it is expected in Washington that rapid improvments will occur in the supply position of all metals, except copper, after that period. Copper is not expected to become more plentiful until 1954, and even then will not meet the national needs of the U.S., but by the last quarter of 1953 most major metals will be meeting both defence requirements and a large number of related industries, at the moment severely curtailed. Some producers of civilian goods should also be able to get more steel and aluminium by then.

This situation has arisen because defence buying has not reached the speed or magnitude that was originally expected. Defence needs have been dove-tailed into the civilian economy more evenly than was anticipated, and the mere existence of the International Materials Conference, representing as it does a concerted effort to ration out available supplies, has tended to steady the raw materials position, and prevent any scramble for supplies. National policies of economising in the use of scarce metals have also played a part in eking out materials.

U.S. defence policy, where it is required to expand production of essential materials, is now more and more employing the device of long-term purchase commitments. That is, where new mines are needed the Government finds it better to purchase the future output of the mine by cash in advance, than loan money for its development. This policy is expected to be followed by the U.S. abroad. Ample credit is available to meet these commitments, as Congress recently amended the Defence Production Act to say that only the 'probably ultimate net cost' of projects to the nation is chargeable against the defence agencies' lending ceiling of $2,100,000,000.

Scientists & Civil Defence

Regional Advisers Appointed

NEED for the best scientific advice to aid in solving problems of civil defence was emphasised by Sir David Maxwell Fyfe, the Home Secretary, speaking at a luncheon of the London Civil Defence Committee on 5 December.

A panel of scientific consultants had therefore been established as honorary advisers in each region. In peace time they would assist in the study of the scientific and technical aspects of national planning of civil defence while also advising the principal officers and local authorities in their respective regions. In the event of war, their positions would be similar to those of senior gas advisers, but their responsibilities would be wider, including the hazards of atomic, biological and chemical warfare.

Senior scientific advisers so far appointed were:—

South Western Region (Bristol): Professor W. E. Garner, F.R.S.; Midland Region (Birmingham): Professor H. W. Melville, F.R.S.; London Region; Sir Charles Ellis, F.R.S.; North Midland Region (Nottingham): Professor L. F. Bates, F.R.S.; Northern Region (Newcastle); Professor W. E. Curtis, F.R.S.; North Eastern Region (Leeds): Professor F. W. Spiers.

Professor W. E. Garner is Professor of Physical Chemistry at Bristol University, Professor Melville is Mason Professor of Chemistry at Birmingham University. Both have given important service to the Government in the field of chemical defence. In the London region, Sir Charles Ellis is the scientific member of the National Coal Board and a former scientific adviser to the Army Council. Professor Bates is Professor of Physics at Nottingham University and president of the Physical Society. Professor Curtis is Professor of Physics at King's College, Newcastle-upon-Tyne, Durham University, and is president of the Institute of Physics. Professor Spiers is Professor of Medical Physics at Leeds University.

Extensions Proposed

Bradford Corporation Sewage Committee proposals to extend the sulphuric acid plant at the Esholt sewage works, Bradford, have been recommended for approval by the Finance Estimates Sub-committee, at a total cost of £45,000. These extensions will make the works almost independent of outside supplies, and should increase the plant's capacity by 50 per cent—from 9,000 to 13,500 tons a year. All the acid is used for the precipitation of wool grease.

Fluid Hydroforming of Petroleum Napthas

by PETER W. SHERWOOD

APPLICATION of the fluid catalyst technique marks an important step forward in the war-developed process of hydroforming. Developed jointly by Standard Oil Development Company, M. W. Kellogg Company, and Standard Oil Company (Indiana), fluid hydroforming has now reached the industrial stage. At this writing, at least three plants employing this new technique are in various stages of construction. A 20,000 barrel/day unit for Cities Service refinery at Lake Charles, a 10,000 barrel/day plant for the same company's East Chicago refinery, and a 2,000 barrel/day fluid hydroformer for Pan-Am Southern Corporation's plant at Destrehan, Louisiana.

Most striking feature of the new development is the application of the fluidised catalyst technique to a high-pressure process. It will permit continuous operation of hydroformers whose catalyst regeneration requirements have, in the past, forced reliance on cyclical operation of multiple reactor systems. As has been the case in fluidised catalyst cracking, the use of a continuous system is expected to result in higher overall yields, and in lowered operating costs. At the same time, fluidised solids technique has the advantage of permitting greater uniformity of reactor temperatures. The operator is thus given greater control over the reaction with resultant favourable effect on the versatility of feedstock which may be handled, and on the yields which may be expected.

Developed During the War

The process of hydroforming was developed during World War II for the purpose of producing aviation gasoline and chemical-grade toluene by aromatising suitable naphtha and gasoline fractions. The process is, in effect, an adaptation of catalytic cracking, using, however, a highly specific catalyst (chromia-alumina) and operating in the presence of hydrogen at elevated pressures. The function of hydrogen is to saturate labile molecular fragments immediately upon formation, and thus prevent their repolymerisation to catalyst-obstructing 'coke'. As a result, the 'on-stream' portion of the operating cycle is lengthened (and may be as high as ten days if a highly naphthenic feed in the C_6-C_8 range is employed). Nevertheless, periodic catalyst regeneration by air blowing is necessary.

Limited Cyclisation

The chemistry of the process involves, above all, dehydrogenation and isomerisation of naphthenes. At the same time, a limited amount of cyclisation of paraffins appears to take place. The ideal feedstock will be rich in hydrocarbons which are readily dehydrogenated. Thus, while the process of hydroforming is applicable to a wide range of gasolines and naphthas, the best performance is achieved for charging stocks rich in naphthenic C_7 and C_8 hydrocarbons. Methyl cyclohexane is readily dehydrogenated to toluene. A small portion of heptane (Fisher and Welty report 16 per cent for one case) is cyclised and dehydrogenated to toluene. Isomerisation of methyl cyclopentane to cyclohexane followed by dehydrogenation to benzene occurs to some extent. Conditions employed for hydroforming over a chromia-alumina catalyst are, however, not ideal for this type of reaction. On the contrary, the presence of large amounts of cyclopentane derivatives is objectionable due to their tendency to form coke, probably via unstable cyclopentadienes. Such feedstocks are, therefore, treated to better advantage by some other reforming process, such as the recently developed 'platforming' which employs a platinum-base catalyst.

Applied hydrogen pressure is carefully balanced against operating temperature to maintain the aromatics-naphthenes equilibrium heavily on the side of the aromatics. (Typical operating conditions are 200-400 p.s.i.g. total pressure and 900-1,000°F. average catalyst bed temperature). As a result of the prevalence of dehydrogenation reactions, the process itself is a hydrogen producer. No outside source of hydrogen is therefore required. Instead, a hydroformer may be employed as hydrogen source for hydrogenation processes of interest for refinery or for petrochemical purposes.

In fluid hydroforming, feed naphtha is pre-heated to reaction temperature (say 950°F.) in a pipe still operated slightly above the pressure of the hydroformer. The vaporised naphtha is then fed to the base

of the reactor in which a bed of fluidised catalyst is maintained.

Inside the reactor, the feedstock is joined by pre-heated recycle gas which contains some 80 per cent hydrogen. Passage through the fluidised reactor permits accomplishment of the desired hydroforming reactions. Contact time in hydroforming technique generally runs about fifteen seconds.

Cyclone Recovery

As in the case of other fluidised catalyst processes, the gaseous effluent leaving the top of the reactor must be freed of entrained catalyst by passage through a cyclone. A recycle stream is injected into the hot product gases for the purpose of quenching and in order to precipitate residual catalyst which has not been recovered in the cyclones (recovery of this catalyst from the scrubbing medium is possible by filtration).

The cleaned product stream is now ready for separation into condensible products and hydrogen-rich gases which serve partly for recycle gas to the reactor. The remainder of the tail gases is used at other sites of the refinery. In the after cooling stage required for this separation of condensibles, fluid hydroforming employs the customary means of optimum heat recovery by heat exchange with incoming feed streams.

Fractions of the catalyst are withdrawn continually from the reactor by means of a standpipe. After passage through a stripper for the recovery of adhering hydrocarbons, the fluidised catalyst is picked up by an air stream and is carried to a regenerator case where coke deposits are burned off. Compared with fluid catalytic cracking regenerators, this unit is marked by its small size because hydroforming, by the very design of the process, results in small carbon formation.

From the regenerator, the catalyst passes through a stand-pipe into the recycle gas stream which will carry it back to the reactor case, thus completing the cycle.

The turbulent mixing inside the reactor chamber permits remarkable temperature uniformity throughout the entire reaction period. This is an important advantage over fixed-bed hydroforming in which the endothermic dehydrogenation reactions result in an overall temperature of as much as 150°F. The drop in temperature encountered in static bed hydroforming tends to defeat the thermodynamic demands to have a high (aromatising) temperature at the end of the reaction when the ratio of aromatics to naphthenes is already high, and particularly drastic reactions conditions are needed to convert the residual naphthenes to aromatic hydrocarbons by the reversible dehydrogenation reaction. Static bed hydroforming overcomes this difficulty to a certain extent by operating in two stages. The maximum temperature drop (about 100°F.) is taken in the first stage in which the bulk of the reactions is allowed to take place. The process stream is then reheated to initial reaction temperature and is introduced into the second stage where the temperature drop normally will not exceed 30-50°F.

The temperature uniformity inside a fluidised catalyst system obviates this need for intermediate reheating. The feed is preheated sufficiently to permit a satisfactory mix temperature (*i.e.*, the drop in sensible heat between feed and mix temperatures must be enough to supply the endothermic heat of reaction inside the fluid hydroformer). A single reaction stage is therefore sufficient in fluidised hydroforming technique.

Because of the uniform operating temperatures and the continuous reaction technique, fluid hydroforming results indicate yields which exceed static bed methods by as much as 5 per cent. At the same time, butane production is remarkably low, and butane from outside sources may be blended with the hydroformate to good advantage in order to bring up the Reid vapour pressure to the permissible 10 p.s.i.

Results, reported for a 50-barrel fluid hydroforming pilot plant are summarised in the following table:—

FEED : 200/330°F. MIXED BASE NAPHTHA

(CFRR octane rating : 49 clear, 64 with 2 c.c. TEL)	I	II
SEVERITY :		
CFRR Octane No. Clear, 10 lb. RVP Gasoline	90	95
CFRR Octane No. plus 3 ml. TEL	98	101
YIELDS :		
10-lb. RVP-400°F. E.P. Gasoline, vol. per cent	97.5	90.0
Extraneous Butane to 10-lb. RVP, vol. per cent	8.0	4.5
C_5-400°F. E.P. Gasoline, vol. per cent	86.0	80.0
Butanes, vol. per cent	3.5	5.5
Polymer, vol. per cent	0.3	0.3
Dry Gas, wt. per cent	6.0	10.5
Carbon, wt. per cent	0.6	0.8

By comparison, common yield figures obtained in static bed hydroforming are between 75 and 80 volume per cent (butane-free). Coke formation is in the neighbourhood of 1.5-2 per cent of the original charging stock.

Revised British Standard

Calcium Carbide (Graded Sizes)

THIS British Standard originally published in 1935 is now issued in revised form, and covers eight sizes of grading. Test requirements for dust, gas yield and impurities are stated and methods of sampling and testing are specified. Conditions of sale and purchase as established by the British Acetylene Association are also given in Appendix B.

Towards the end of the 1939-1945 war it became evident that the methods of sampling, and the methods for the determination of gas yield, purity of acetylene and impurities required to be brought up to date. Accordingly, the Technical Committee concerned with the preparation of the original standard recommended its revision.

The standard was originally published as a result of an agreement between the British Standards Institution and the British Acetylene Association to co-operate in the preparation and establishment of a British Standard for calcium carbide based upon the standards, conditions of sale and purchase, and the trade usages in the industry existing at that time.

Main Alterations

The main alterations in the revised standard are to be found in Appendix A, in which new apparatus and improved methods for the determination of gas yield and impurities have been included. The specification section now stipulates that the carbide shall yield gas containing not less than 99 per cent by volume of acetylene, instead of 96 per cent as in the original standard. Limits for arsenic and nitrogen compounds have been added to those for sulphur and phosphorus. Appendix B remains unaltered, except that the amounts of gas yield below which claims and rights of refusal are allowed have been slightly increased for all sizes below 15 mm. to accord with the tolerance of minus 5 per cent specified in Clause 5.

During the preparation of the original standard, the Committee had the advantages of the views and co-operation of the Dominion interests concerned, as well as the close collaboration of the associated European manufacturers of carbide. This close co-operation has been continued during the present revision.

Copies of this standard may be obtained from the British Standards Institution, Sales Department, 24 Victoria Street, London, S.W.1, price 4s. post free.

Acceptation Recommended

THE first volume of the first International Pharmacopœia was put before the Pharmaceutical Society in London on 3 December by Dr. C. H. Hampshire, C.M.G., chairman of the committee of experts from seven countries which have produced it.

The general assembly of the World Health Organisation, said Dr. Hampshire, has formally recommended its 68 member States to accept the book, the first objective of which is the attainment by all peoples of the highest possible level of health. The advantages of uniformity in national pharmacopœias were, he said, obvious. Differences in national standards for widely used materials were a hindrance to the spread of medical knowledge, an inconvenience to pharmacists who had to dispense prescriptions brought from various countries, and a source of trouble, possibly of danger, to travellers, who might experience delay in receiving medicines which had to be specially made or procured.

The book, which was now available in its English and French versions, comprised 199 monographs containing descriptions, standards, tests and assays designed to provide as complete a control specification as possible for each drug. It was to be noted, Dr. Hampshire pointed out, that the doses were for adults. A table of doses for children was in preparation for volume II, but the difficulties in securing agreement here were even greater, he said, than with the doses for adults.

Rust Proofing Method

An economical method of preventing rust and corrosion of metal parts in the presence of air and moisture is said to be provided by 'VPI' crystals, a slightly volatile amine nitrite now being made available to industry by the Shell Oil Company, New York. This volatile corrosion inhibitor is used in protecting metal parts, assemblies, instruments and finished products during shipment, storage and through various processing steps. Being slightly volatile at atmospheric temperatures, 'VPI' gives off vapours which are carried to all surfaces.

Carbide Furnace Described

A JOINT meeting of the Society of Chemical Industry, Liverpool Section, and the North-Western Branch of the Institution of Chemical Engineers was held at Liverpool on 1 December, when Mr. R. B. Peacock presented 'A Study of Carbide Furnace Operation'.

The furnace was the smaller of two that produced calcium carbide in this country and it had evidently been scaled down from the larger one. The steel walls of the furnace were brick-lined and the hearth was made of carbon blocks. Electric current at 113-158V was passed through three vertical electrodes with tips of hard, amorphous carbon baked from carbon paste, which is continuously fed to the electrodes to replace consumption at the tips. The electrodes are movable and produce at 1,800-2,000°C. liquid carbide that is tapped from the furnace into bogies.

Mr. Peacock described early trials of the furnace on about half-load. Excess lime was used and the original anthracite was replaced for the better by coke. Investigations gave improvements in technique until it was possible to operate the furnace at full electrical load with covered electrodes in a full furnace of coke and lime for a period of two years. The path of the current from an electrode was a cone expanding from the tip to the hearth, through the carbon blocks and up through the charge to the other electrodes. A graph of the ranges of resistance, power factor, voltage and electrode diameter was plotted to give operational data for a new design of furnace.

Nuclear Moment

Analysis of Solids and Heavy Isotopes

IN a report from the University of Electro-Communications in Tokyo, Japan, an apparatus is described for observing nuclear magnetic resonance for qualitative and quantitative analysis, as an extension of previous research on high frequency titrimetry.[1] This resonance experiment has already been carried out elsewhere for the precise measurement of moments[2] or of magnetic field.[3]

The sample is mounted in a coil of the receiver circuit and the coil is placed in the magnetic field with its axis perpendicular to the field direction. The radio-frequency waves of constant frequency (15.25 Mc.; with the modulation unit of 289 c.p.s.) are supplied to this circuit and the strength of the magnetic field is varied very slowly. The transitions occur, which result in an absorption of energy from the radio-frequency field, when the radio-frequency coincides with the Larmor precessional frequency of the atom. As the moment of $_1H^1$ is close to that of $_9F^{19}$, the absorption lines of the two elements have been compared with each other. The intensity of the energy absorption, which is measured by the voltage drop of the power output from the detector circuit, has shown good correspondence with the amount of each element in the sample, as can be seen from the accompanying table.

	Sample		Intensity of the energy absorption	
	Paraffin + Na_2SiF_6		$_1H^1$, volt	$_9F^{19}$, volt
1 ..	0.5 g.	0 g.	−0.10	0
2 ..	,,	0.1	−0.10	−0.08
3 ..	,,	0.3	−0.10	−0.27

when the sensitivity of the apparatus was constant. When the sensitivity was raised sufficiently, the energy absorption line was easily observed using 0.1 mg. of fluorine.

With improvements in the apparatus it will be possible to use this method especially for the chemical analysis of solids, says the author, also as the only really suitable method for the determination of heavy metal isotopes.

REFERENCES

[1] Fujiwara and Hayashi. *Report of Univ. of Electro-Communications*, *1*, 112 (1950).
[2] Mack, *Rev. Modern Phys.*, *22*, 64 (1950).
[3] Hopkins, *Ref. Sci. Inst.*, *20*, 401 (1949).

The Art of Selling

MR. Kenneth Horne, sales director of the Triplex Safety Glass Co., Ltd., addressed a sales convention held by Monsanto Chemicals, Ltd., in London on 6 December. Mr. Horne, the broadcaster, took as his subject 'The Art of Selling'.

He said that the customer's point of view was regaining the significance which it had never lost with wiser suppliers. Since the war many industries had found the end of the sellers' market upon them without warning. In the export field, too, Britain was once again having to fight to sell her goods.

Mr. Horne thought it all-important that a potential customer's first contact with any firm should register a favourable impression. For that reason such apparently minor matters as the attitude of telephone operators, the phraseology of letters, and the treatment of factory visitors, were vital.

Polymer-Fume Fever

Fluon's Fumes Mildly Toxic

IN the 1 December issue of *The Lancet*, Dr. D. Kenwin Harris, Divisional Medical Officer, I.C.I. Plastics Division, has written an article entitled 'Polymer-Fume Fever'.

In this article a brief description is given of polytetrafluorethylene and evidence is presented to show that this important thermoplastic gives off an invisible fume which produces toxic symptons when inhaled. This fume may be produced (according to Dr. Harris) by heating above 300°C. or even by high-speed friction, and in his article he describes some case histories of people who have inhaled it, outlines the symptons and recommends a treatment.

There is (he states) always a latent interval, often of a few hours, between the original exposure to the fume and the development of the symptoms. People who are unaware of the hazard sometimes think they are developing a cold or influenza and it is not uncommon for employees not to report the matter until they have had more than one attack. Discomfort in the chest, especially on taking a deep breath, a feeling of irritation or oppression retrosternally and a dry irritating cough are common symptoms, but are not always noticed. After a few hours there is a gradual increase in temperature, pulse-rate and possibly respiration rate, followed in most cases by a shivering attack and sweating. The acute attack subsides quickly and within a day or two at the most the patient has completely recovered.

Prevention Possible

The fever can be prevented by the application of local exhaust ventilation to the fume source and treatment consists of removing the patient from the contact with the fume, giving rest and treating symptomatically. The administration of oxygen relieves most of the symptons quickly.

The exposure of rats to the vapour at the Industrial Hygiene Research Laboratories of I.C.I. caused respiratory irritation and subsequent pulmonary oedema and haemorrhage.

Investigations so far have failed to reveal the exact nature of the toxic substance although very small quantities of iron, nickel, copper, zinc and boron were discovered in the polymer ash. Only a minute trace of copper, however, was found in the sublimate when the polymer was heated to 400°C.

Liverpool's New Chemical Block

LAYING of the foundation stone of a new chemistry building for the University of Liverpool, was the first duty performed on 28 November by the Marquess of Salisbury, in a full programme which marked his installation as Chancellor of the University. The site of the new block is in Vine Street, close to the University.

Lord Salisbury expressed pleasure that his first task should be to give this send-off to the erection of a building of chemistry research and teaching. The fact that such high priority in the University's building programme had been given to this subject was a symbol of its forward outlook. It might be considered that there was nothing new in that because the University's first chemistry building was occupied as far back as 1886, when it was still in its early days as University College.

When completed, the new building would contain five large teaching laboratories, two lecture theatres, each to seat 150, and one lecture theatre with 300 seats.

Estopen—Lung Penicillin

THE new penicillin ester—Estopen—manufactured by Glaxo Laboratories and only a few months old, was discovered by accident. Danish research workers, searching for an improved 'prolonged action' type of penicillin, fortunately determined the level of penicillin occurring in different organs of the body following injections of various forms of the drug. In this way it was discovered that 'Estopen' produced concentrations in the lung far higher than elsewhere and higher than those derived from any other preparation. Investigations showed that the ester gave levels five times as high as sodium penicillin, and subsequent trials amply demonstrated, say Glaxo, that it radically changes the prognosis of all penicillin-senstive infections of the lungs, pleura and bronchi. Its clinical effects are prompt, as exemplified by the rapid fall in ectasis. Its use is recommended for bronchitis, pulmonary abscess, pneumonia, pleurisy, lung infections connected with pulmonary carcinoma, as well as secondary infections.

• OVERSEAS •

Colombian Soda Ash Plant

Reports to hand from Colombia state that the soda ash plant established by the Instituto de Fomento Industrial (the Industrial Development Institute) in collaboration with the Banco de la Republica, which will shortly be completed, is designed to produce 51,830 tons p.a. This quantity is however now considered to be insufficient and plans are being made to extend this plant in order to produce another 36,500 tons p.a.

Inquiry Widened

The American Congressional committee on chemicals in foods, headed by Congressman Delaney, which is at the moment occupying itself with fruit-growing and canning —the whole committee is visiting the West Coast, including Seattle, Los Angeles and San Francisco—is expected shortly to begin hearings on cosmetics. Last September cosmetics were authorised to be added to the committee's field of inquiry by Congress, and qualified witnesses are being lined up now for hearing.

Kaiser Aluminium

The Kaiser Aluminium & Chemical Corporation's plant at Baton Rouge, Louisiana, is stepping up production of alumina from 300,000 tons to 450,000 tons a year shortly, an increase equivalent to 900,000 tons of bauxite. Guiana bauxite is being used at present, but Jamaica will supply ore as soon as shipments can be started—probably about the middle of 1952.

U.S. Synthetics Industry

The extent of the synthetic organic field in America is indicated by figures given for last year by the Tariff Commission. Money spent on research in 1950 jumped by $9,800,000 to $115,100,000. The average salary paid to research workers was, however, down $401 to $5,377, probably due to an increase in the number of lower paid workers; the total number of technically trained men and women employed was 10,529. Organic chemical manufacturers spent more on research 'farmed out' to universities, private laboratories and consultant services, and the figures for the 335 firms who reported their expenditure amounted to $6,600,000.

Montecatini Group's Expansion

The Montecatini group, the well-known Italian company engaged in mining and the manufacture of chemicals and metals, is to absorb two other Italian firms, *viz.*, the Nobel-Società Generale di Esplosivi e Munizione and the Società Italia Settentrionale. The Nobel company produces various explosives and has in recent years also erected factories for the manufacture of chemicals, while the activities of the second firm range from liquid and gaseous hydrocarbon products to fertilisers, plastics and intermediate chemical products in general.

U.S. Graduate Increase

The only hopeful sign in the black outlook for chemical and engineering graduates over the next decade comes from New York University's College of Engineering, which reports a 6.6 per cent increase in the number of graduate students this fall.

Chilean Potash Nitrate

The Nitrate Corporation of Chile, Ltd., announce that until further notice, and subject to supplies being available, Chilean potash nitrate, containing about 15 per cent nitrogen and about 10 per cent potash (K_2O), as well as sodium and over 30 trace elements, will be sold in lots of 6 tons or more, delivered carriage paid to any railway station in Great Britain or c.i.f. main ports in the Isle of Man, for prompt delivery at £33 15s. per ton of 2,240 lb. gross weight. Contracts for delivery up to 31 March, 1952, can be made but the goods would be invoiced at this price or as ruling at date of delivery. Smaller lots delivered carriage paid will be sold at the above price plus the following surcharges: 4-6 tons, 5s. per ton; 2-4 tons, 10s. per ton; 1-2 tons, 20s. per ton; 2 cwt.-1 ton, 30s. per ton. There are no surcharges for lots of 2 cwt. or more collected from the company's nitrate depots, but there is an allowance of 10s. per ton. Wholesale terms to fertiliser manufacturers and merchants are as follows: Trade commission 20s. per ton. Terms of payment are net cash in 30 days from date of delivery. This price list is issued on behalf of the Ministry of Materials, who reserve the right to withdraw it at any time without notice.

PERSONAL

Awards for 1951 by the Mond Nickel Fellowships Committee have been announced as follows:—

MR. J. PRESTON (British Non-Ferrous Metals Research Association), to study in Britain, Canada, and the U.S.A., specialised methods of production and fabrication of metals with particular reference to powder metallurgical techniques.

MR. P. E. WHITE (J. B. and S. Lees), to study the metallurgy and detailed production technique of high quality strip steels, in the U.K., Scandinavia, Canada and the U.S.A. with particular reference to hardened and tempered steel strip, stainless steels and silicon steels.

MR. P. J. HILL (Public Works Department of Western Australia), to study in the U.K. the application of research to the development of corrosion-resistant metals for use in the mechanical engineering industry.

DR. FREDERICK S. GORRILL, M.D., M.R.C.P. (Lond.), F.R.C.S. (Eng.), B.Sc. (Chem.), has joined the Board of Evans Medical Supplies, Ltd., with the executive responsibilities of production director for five of the company's establishments. Dr. Gorrill joined Evans last February as deputy medical director, The Evans Biological Institute. He was born in Okehampton, Devon, in 1913 and was educated at Torquay Grammar School and Kings College, London, where he took an honours degree in chemistry. Following this, he studied medicine at Charing Cross Hospital, where he qualified in medicine in 1939, joining the RAMC shortly afterwards.

At the annual general meeting of the British Tar Confederation held on 29 November, 1951, the following were elected as officers of the Confederation for the year 1951/52:—

President: SIR WALTER BENTON JONES, Bart.; Honorary Treasurer: MR. C. E. CAREY; Chairman of the Executive Board: MAJOR A. G. SAUNDERS; Vice-Chairman of the Executive Board: MR. W. K. HUTCHISON and MR. LESLIE O'CONNOR, C.B.E.

The executive board consists of the following representatives:—

Association of Tar Distillers: MR. L. W. BLUNDELL, MR. C. E. CAREY, MR. E. HARDMAN, CAPT. C. W. HARRISS, MR. C. LORD, MR. WM. MCFARLANE, MR. S. ROBINSON, MAJOR A. G. SAUNDERS, MR. L. SHUTTLEWORTH, and MR. W. A. WALMSLEY.

British Association of Coke Oven Tar Producers:—MR. A. BRADBURY, MR. G. W. J. BRADLEY, MR. W. ROBSON BROWN, M.P., MR. K. MCK. CAMERON, MR. F. W. O. DODDRELL, MR. C. F. DUTTON, MR. C. M. FRITH, LT.-COL. P. F. BENTON JONES, MR. LESLIE O'CONNOR, C.B.E., and MR. C. F. SULLIVAN.

Gas Council:—MR. S. BLACK, MR. F. BOARDMAN, MR. D. D. BURNS, MR. W. HODKINSON, MR. W. K. HUTCHISON, MR. A. W. LEE, MR. A. MCDONALD, MR. M. MILNE-WATSON, COL. H. C. SMITH, C.B.E., D.L., J.P., and MR. S. E. WHITEHEAD, O.B.E., J.P.

Obituary

DR. SYDNEY HILL, a member of the research staff of Peter Spence & Sons, Ltd., died as a result of a street accident on 27 November, in his twenty-eighth year.

He was educated at Holt High School, Liverpool, and proceeded to Liverpool University where he graduated B.Sc. (Hons.) in 1943 and was awarded the Campbell Brown Fellowship. He joined the staff of Peter Spence & Sons, Ltd., in 1943, and was granted leave of absence from 1945 to 1948 to take up the Fellowship. For research work in electro-chemistry he was awarded his Ph.D. in 1948. This work was the subject of several papers published jointly with A. Hickling in the *Transactions of the Faraday Society* and the *Journal of the Electrochemical Society*.

He returned to industrial work and at the time of his death was engaged in advanced electrochemical investigations. He was elected an Associate of the Royal Institute of Chemistry in 1944 and was also a member of The Society of Chemical Industry, The Faraday Society, and a Fellow of the Chemical Society.

His tragic death at an early age closes a career that held great future promise.

• HOME •

OCCA Holds Meeting

A paper entitled 'Pigment Flotation in Paints—a Dynamic Phenomenon' by Dr. S. H. Bell and Mr. E. W. M. Fawcett, both of the Paint Research Station, will be presented to the Oil & Colour Chemists' Association (London Section) at a meeting to be held at Manson House, 26 Portland Place, London, W.1, at 7 p.m. on Tuesday, 18 December. Refreshments will be provided.

SCI Summer Tour

A visit to Switzerland in May next year is being organised for its members by the Fine Chemicals Group of the Society of Chemical Industry. The party (which must be limited to 50 members), will have the opportunity of seeing hospitals, universities, laboratories, and factories and will be entertained by various chemical societies. The tour will include Basle, Vevey, Lausanne, and Zürich. Early application is essential owing to the limitation of numbers.

Tax-Free Dispensing Packs

The Commissioners of Customs and Excise have reviewed the conditions under which tax-free dispensing packs of proprietary or branded preparations of official drugs or medicines may be supplied to works' first-aid rooms in accordance with Notice No. 78B, page 18, paragraph 8, and they have decided that, where a factory claims entitlement to receive dispensing packs tax-free, orders for the supply of the drugs must be authenticated by the doctor and the drugs must be consigned to him at the factory or elsewhere.

Chemical Warehouse Fire

Fire broke out at midday on Saturday, 1 December, in a three-storey chemical warehouse owned by J. W. Towers & Co., Ltd., at Bridge Road, Stockton-on-Tees. The building was gutted but firemen prevented the flames from spreading to some chemicals in the front shop of the premises. The company announces that it has an adjacent warehouse in Stockton and replacement stocks have been sent from Widnes and Manchester so that orders in the north-east of England may be dealt with without undue delay.

Coal Board Aims

Expansion of the chemical raw materials industry in Scotland is a long term aim of the National Coal Board, Dr. E. A. C. Chamberlain of the N.C.B. told the Institute of Mining Engineers in Glasgow. There was a growing need to make better use of chemical raw materials, not only to give petrol and oil, but to supply the pharmaceutical, dyestuffs and plastics industries with basic intermediaries. The coal industry had a responsibility to ensure that adequate research was maintained in these directions.

Consultant Moving

From 1 January the address of Mr. L. D. Galloway, consultant Industrial microbiologist, will be changed from 24 Welbeck Way, W.1, to 36 St. James's Street, S.W.1.

Water-Gas Production

Imperial Chemical Industries, Ltd., have for some years been engaged on development work on an extensive pilot-plant scale for a process of water-gas production in a fluidised bed. The work has now reached a stage at which publication has become desirable, and an important paper entitled 'Gasification by the Moving-burden Technique' is to be read to The Institute of Fuel by J. W. R. Rayner, of I.C.I., on Tuesday, 18 December, at The Institution of Mechanical Engineers, Storey's Gate, London, S.W.1, at 5.30 p.m. Tea will be available at 5 p.m. The meeting is open to all, and it is expected that it will particularly interest gas and chemical engineers.

Explosion at Fuse Factory

Only one man received slight shock when an explosion occurred at the safety-fuse factory of Imperial Chemical Industries, Ltd., Camborne, Cornwall, on 9 December. In spite of the danger of a second explosion the workers fire unit helped those in the department concerned to safety. Half the roof was blown off and fire had spread rapidly when engines of the Cornwall Fire Brigade arrived. Shift work was maintained during the week-end at the works which produces mining safety-fuse both for export and home use.

The Chemist's Bookshelf

INDUSTRIAL WASTES. By C. H. Lipsett. The Atlas Publishing Co., Inc., New York. 1951. Pp. 317. $5.

It is unusual to discover a book devoted entirely to the recovery and utilisation of waste products. Information of this kind is usually included in textbooks dealing with the particular industry concerned. The present volume, which reviews in a general fashion the whole field of industrial scrap and waste from metal scrap to brewery wastes, has been written by a man who must be the greatest authority upon the subject in America, if not in the world. Mr. Lipsett, we are told, has been concerned with the disposal of war surplus stores after two world wars and was recently an adviser on raw materials to the administrators of the War Mobilisation Programme. In addition he is the publisher of a periodical dealing with salvage, *The Waste Trade Journal*.

The subject is a very important one in these days of increasing raw material costs and exhaustion of deposits. It is significant that very little has been heard from the productivity teams who have visited America upon this aspect of efficiency. With this in mind, however, it is difficult to imagine who the book was originally aimed at. In this country, the large industries deal with their own wastes when this is economical, and the collection of small quantities of wastes such as paper from many sources is organised by authority. The worst offenders we have are probably the armed forces who periodically litter the countryside with corrugated iron, barbed wire and spent ammunition cases which should find their way back directly to the scrap heaps and furnaces.

The chemical section is small and disappointing and will not be of any great interest to the British reader. The author has deliberately written this section in the most general and non-technical terms and this has given it an air of inconsequence like a description of a symphony in non-musical terms. There is a very full account of the recovery of calcium carbonate from water treatment plant and the recovery of magnesium bisulphite from wood digester waste liquor. Neither of these involved descriptions is given the benefit of a diagram or flow sheet and are difficult to follow. Other topics discussed in much less detail are the production of lactic acid by the fermentation of sulphite waste liquor, the recovery of carbon dioxide from lime kilns, the chlorination of ethane in unspecified waste gases to ethyl chloride and the extraction of cholesterol from wool grease.

The scrap metal industry is much better served, and in addition to a very complete description of the organisation and commercial significance of the scrap iron industry, there are chapters dealing with copper, lead, zinc, aluminium, tin, nickel, platinum, gold, and silver.

The recovery of chemicals from the processes carried out in the production of viscose rayon is reviewed in a separate chapter and this section is particularly applicable to British industry at present because all the substances recoverable except caustic soda contain sulphur. They include carbon disulphide, hydrogen sulphide, magnesium sulphate and other sulphates.—J.R.M.

CHEMISCHE TECHNOLOGIE. By Drs. Karl Winnacker and Ernst Weigärtner. Carl Hanser Verlag, Munich. 1950/51. In five Volumes. Vol. I. Pp. XX + 609. Dm. 37. Vol. II. Pp. XIX + 644. Dm. 41.

For this collective work on Chemical Technology the editors, with the help of many expert contributors, plan five volumes, of which Volumes I and II, dealing with inorganic technology, have already been published, while III and IV will be devoted to organic technology. Volume V is intended to comprise, besides metallurgy, sections on general technology, raw materials, physical analysis methods, energy in chemical plants, works planning, safety measures and the fundamentals of industrial legal protection, etc. The whole publication, keeping in touch with the latest develop-

ments and products of the chemical industries, will be completed not later than the spring of 1952, and will form a substantial reference work for a mass of specialised material. It will fill an often felt gap between the proper textbooks on chemical technology and the great reference books, like, for example, the American Encyclopædia by E. E. Kirk and D. Othmer, the Encyclopædia of Technical Chemistry by F. Ullmann and Thorpe's Dictionary of Applied Chemistry. It will thus cover a wide range of products and be a guide for research and practice to serve the technical chemist, the engineer, the economist and students.

The books have been written by well-known experts, who present a description of their actual sphere of work with its historical, economical, theoretical and technical foundations, and each of the contributions forms a useful summary of general reference information. Combining science and practice, they present a series of monographs which, although not uniform in presentation and style, form a harmonious sequence.

Volume I is introduced by a comprehensive chapter which deals with the general principles and the fundamentals of the methods. Other chapters deal with drinking and industrial waters, air liquefaction and preparation of oxygen, the potassium industry, boron and boron compounds, common salt and alkalis, chlorine and its inorganic conversion products, fluorine and fluorides, and the per-compounds, of which the modern processes for the production of hydrogen peroxide are paramount.

The second volume completes the inorganic part. Starting with the sulphur compounds, it deals with the elementary sulphur and its deposition from gases, with sulphuric acid, its manufacture and recovery as well as its most important derivatives. Other chapters cover the production of phosphorus, phosphoric acid and its salts; nitrogen, ammonia and nitric acid and their compounds and salts; calcium carbide and silicon carbide, mortar binders and fillers; ceramics; chromium compounds; manganese compounds; mineral dyestuffs; and the determination of particle sizes. The final section on high surface area materials discusses the production of adsorbents such as active charcoal, silica gel, active bleaching earth, kieselguhr and bauxite, with details concerning their application in various fields of chemical technique. Numerous bibliographical and statistical data offer assistance in tracing original papers, patents, monographs and literature, and a detailed subject index is of great use to the reader.—F.N.

Oxygen Used in Bessemers

AMERICAN tests with Bessemer converters have established that the addition of 0.995 per cent oxygen to the purifying air blast can shorten each 30-ton 'blow' by 1-2 minutes. In an 8-hour day this time saving means that each Bessemer converter can treat an additional 60 tons of steel, and that at least five tons of scrap, as opposed to three normally, can be used. So the amount of pig iron that has to be fed to the converters is cut down, reducing in turn the tonnage of iron ore, limestone and coke needed by blast furnaces to make the pig iron. Oxygen properly used is said not to have an adverse effect on the life of converter bottoms and linings, in fact, probably to give some improvement. Actual amounts of oxygen used in tests have been 4,000-6,000 cu. ft. for each 30-ton blow. The most effective feed rate was 1,000 cu. ft. per minute, and the best time for adding it was during the first four minutes of that part of the blow designed to remove carbon from the charge.

Laporte Awards

ON 15 November, 1951, Mr. L. P. O'Brien chairman and managing director of Laporte Chemicals, Ltd., presented gold watches on behalf of the company to employees who had completed twenty-five or more years' service. Similar presentations were also made to long serving employees at Hunt Brothers (Castleford), Ltd., John Nicholson & Sons, Ltd., and Wm. Burton & Sons (Bethnal Green), Ltd., subsidiaries of the Laporte Group. In all 158 awards were made.

Making the presentation at the Town Hall, Luton, the chairman, himself a 'long service man,' said that the high proportion of employees of long experience was a confirmation that the industry was a healthy one. As far as Laporte Chemicals was concerned it indicated that there was a hard core of good stable people upon whom the company could rely.

An informal party provided by the company completed the occasion.

Publications & Announcements

SUNVIC Controls Ltd., announce the production of a new electronic relay (Type E.D.2) which reduces current in the contacts associated with the bimetal thermostat, contact thermometer or toluene regulator to a negligible value, thus eliminating the need for a snap action. Snap action, designed to prevent arcing at the contacts, represents a temperature differential at the control point, and is hence a source of error. In addition, the incorporation in the output of the relay of a thermally operated energy regulator unit renders it responsive to the mean current passing through the contacts, say the company. If, therefore, vibration is introduced at the thermostat contacts, there is a small range of temperature over which proportional control is provided, greatly improving the accuracy with which the controlled temperature is maintained.

* * *

PRAT-DANIEL (Stanmore), Ltd., makers of the Prat-Daniel tubular dust collectors, have developed a flue gas sampling equipment which keeps the flow of the sample of gas under test the same as that in the duct. The sample is passed through a scrubber, where it is washed, and the dust retained. The control panel is made of aluminium angle, and its sections are bolted together so that it can easily be assembled or taken apart for transport. All measuring instruments—flow meters, thermometers, inclined and U-gauges are grouped together and are an integral part of the panel, say the makers. It is therefore an easy matter for the test engineer to record all necessary measurements and regulate the rate of sampling. The sampling nozzle is made of stainless steel and is screwed to the mild steel sampling tube. Rubber steel-lined hose is used to make connections between the sampling tube, gas scrubber, panel and exhauster.

* * *

A NEW book just published by The Tintometer Limited is entitled 'The C.I.E. International Colour System Explained.' In it the author, G. J. Chamberlain explains in non-technical language (as far as possible) this means of describing accurately without recourse to samples, any existing colour combination. With the simpler additive colour triangle it is not possible to give a true description of any colour because the secondary colours given by it are not as pure as the corresponding spectral versions, consequently varying amounts of the opposite primary have to be added to the spectral colour to match the triangle's secondary colour. By plotting a locus of the spectral colours outside the additive triangle it is possible to obtain 'stimuli,' or theoretical primaries purer than the spectral ones, which will enable any colour to be described by co-ordinates. The book is simply laid out and has graphic, if slightly unorthodox, methods of explaining mathematical operations. It should be useful to all who lack a knowledge of the principles of colour.

* * *

JENOLITE, Ltd., announce the production of a new line in corrosion prevention. Additional to their existing fluid for removing rust and preventing corrosion the company have developed a chemical sealer which is said to enhance the protection afforded by the liquid application. This sealer, say the company, not only reacts with any surplus Jenolite left on a metal surface after application of the liquid (obviating having to wait until the surface is completely dry), but forms with it an additional coat with superior corrosion-resisting qualities. Paint may be applied on top of this chemical sealer.

* * *

THE latest publication of the British Constructional Steelwork Association is a paper on 'The Application of Plastic Theory to the Design of Mild Steel Beams and Rigid Frames,' written for the Association by F. A. Partridge, B.Sc. (Eng.) London, A.C.G.I., M.I.C.E., M.Inst.W. The booklet refers to British Standard 449: 1948 on 'The Use of Structural Steel in Building', which gives the designer the choice of three methods for the design of a steel framework, namely, simple design, semi-rigid design and fully rigid design. The purpose of this article is to explain what happens when steel members are bent beyond the elastic range to failure, to show how failure loads can be estimated, and so to introduce the Plastic Theory—in its application to beams and portals—as the basis for 'fully rigid design'.

Law & Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

EVANS MEDICAL SUPPLIES, LTD., Liverpool. (M., 15/12/51.) 1 November, supplemental deed dated 26 October, securing £652,000 first debenture stock with a premium of £5 per cent in certain events (inclusive of £402,000 outstanding and secured by a Trust Deed dated 4 March, 1943), present issue £250,000; charged on properties and a general charge as charged by principal deed and on specified properties, at Speke.

PHILBLACK, LTD., Bristol, manufacturers of carbon black, etc. (M., 15/12/51.) 9 November, debenture to Martins Bank, Ltd., securing all moneys due or to become due to the Bank; general charge (except, etc.) (ranking in priority to Trust Deeds dated 5 May, 1949, and 23 November, 1950). *£600,000. 7 March, 1950.

THERMAL SYNDICATE LTD., Wallsend, silica ware manufacturers. (M., 15/12/51.) 1 November, £22,550 charge, to Rock Permanent Benefit Building Society; charged on specified properties at Tynemouth, Newcastle, Wallsend, Cullercoats, Monkseaton and Workington. *£70,000. 13 April, 1951.

Satisfaction

PEST CONTROL LTD., Bourn (Cambs.) (M.S., 15/12/51.) Satisfaction 10 November, part of property comprised in Trust Deed registered 6 April, 1950 (part of Manor Farm, Little Shelford), ceased to form part of the company's property or undertaking.

New Registration

Vulcan Fumigator, Co., Ltd.

Private company. (501,878). Capital £1,000. Manufacturers of insecticides and chemical substances used for agriculture, etc. First directors to be appointed by subscribers. Reg. office: 151 Strand, W.C.2.

Company News

Hickson and Welch (Holdings), Ltd.

The company was incorporated in England in September, 1951, with the object of acquiring three companies: Hickson & Welch, Ltd., Hickson's Timber Impregnation Co. (G.B.), Ltd.; and Hickson's Timber Impregnation Co. (N.Z.), Ltd. The new company's capital is £550,000 divided into 150,000 six per cent redeemable cumulative preference shares of £1 each, and 800,000 ordinary shares of 10s. each. Hickson & Welch, Ltd., are manufacturers of dyestuff and pigment intermediates, sulphur black, agricultural fungicides, herbicides and insecticides.

Next Week's Events

MONDAY 17 DECEMBER

Royal Institute of Chemistry

Stockport: Central Library Lecture Hall, 6.30 p.m. Dr. J. F. Wilkinson: 'The Uses of Some Newer Drugs in Medicine'.

Society of Chemical Industry

Leeds: Lecture Theatre, The University, 7 p.m. A. W. Wolstenholme: 'The Application of Silicones in the Chemical Industry'.

Institute of Metal Finishing

London: Northampton Polytechnic, St. John Street, Clerkenwell, E.C.1. O. Wright and H. D. C. Rapson: 'Immersion Tinning of Steel by Internal Electrolysis'.

TUESDAY 18 DECEMBER

Society of Public Analysts

London: Park Lane Hotel, Piccadilly, W.1, 7 p.m. Informal dinner. A report will be heard from the members of the Delegation attending the XII International Congress of Pure and Applied Chemistry.

WEDNESDAY 19 DECEMBER

Society of Chemical Industry

London: Waldorf Hotel, Aldwych, W.C.2, 4 p.m. Symposium on 'Radiochemistry'. Speakers: Sir John Cockcroft, Dr. J. E. Johnson, and J. Smith. (Jointly with RIC.)

FRIDAY 21 DECEMBER

Society of Instrument Technology

Manchester: College of Technology, 7.30 p.m. J. Blears: 'High Vacuum Technique'.

CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

CHEMICAL ENGINEERS are required at various levels in the Design and Development Department of a well-known Chemical Manufacturing Company in South Lancashire. Starting salary will depend upon qualifications and experience, but will not be less than £600 per annum. The Company encourages effort and enterprise, and promotions are strictly by merit and ability. Write, stating age, qualifications and experience, **BOX NO. C.A.3071**, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

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Experience in design and erection of gas works by-product or tar distillation plants desirable, but not essential. Permanent position. Pension scheme, canteen, etc. Salary, £1,000 to £1,250.

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4 SIFTER MIXERS by Young. M.S. mixing trough, 64 in. by 21 in. by 22 in. deep. Blending chamber feeds material to positive action brush sifter. Fast and loose pulley drive.

Horizontal **MIXER.** Single trough, 4 ft. by 1 ft. 9 in. by 2 ft. 4 in. deep. "Z"-type agitator. Pulley drive. Arranged hand tilting.

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RUBBER LINED cylindrical tank 4 ft. diam. by 6 ft. complete with man hole cover. Suitable for acid storage.

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One 30′ × 7′ 8″ diam.
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UNUSED Vertical 3-throw **RAM PUMPS** by Lee Howl. Gunmetal rams, arranged belt drive through friction clutch. Capacity, 2,500 gallons per hour; 300 ft. head.
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No. 209 One HORIZONTAL "U"-SHAPED MIXER, steel built, riveted, measuring about 8 ft. 3 in. long by 3 ft. wide by 3 ft. 3 in. deep, with horizontal shaft, fitted with bolted-on mixing arms about 18 in. long by 4 in. wide, with intermediate breakers, and driven at one end by a pair of spur gears, with countershaft, fast and loose belt pulleys, outer bearing and plug cock type outlet at the opposite end, mounted on two cradles fitted to two R.S.J. running from end to end.

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